Plant Engineering

IN THIS ISSUE

Safety Crimes 15

To Eliminate Fires: Eliminate the Causes. *By O. W. Stewart* 16

Application of Portland Cement Paint 18

The Know How of Car Loading. *By H. R. Been* 20

Electro-fluid Drive on Punch Press. *By R. O. Fristoe* 21

Solution Cleaning of Floors and Walls. *By R. L. Fiske* 22

Process Heat for Better Canned Tomatoes. *By Arthur A. Conte* 23

Radiant Heated Road is Free From Snow 25

Metal Finishing Practice at Willow Run. *By D. D. Herrman* 26

The How and Why of Steam Trapping. *By H. G. Ebert* 28

The Role of Arc Welding in Remodeling Machinery. *By Robert J. Jacobs and Howard Sechrest* 30

How to Keep an "Eye on the Sky" 31

Lights Go Up 8 Ft—Drill Goes Down 3 Ft 31

Softening Diesel Engine Cooling Water 32

Pipe Cradle for Use in Sandy Soil 32

REGULAR DEPARTMENTS

Letters from the Readers 4

New Products and Methods 6

Maintenance and Operation 33

Questions and Answers 35

Plant Engineers' Digest 36

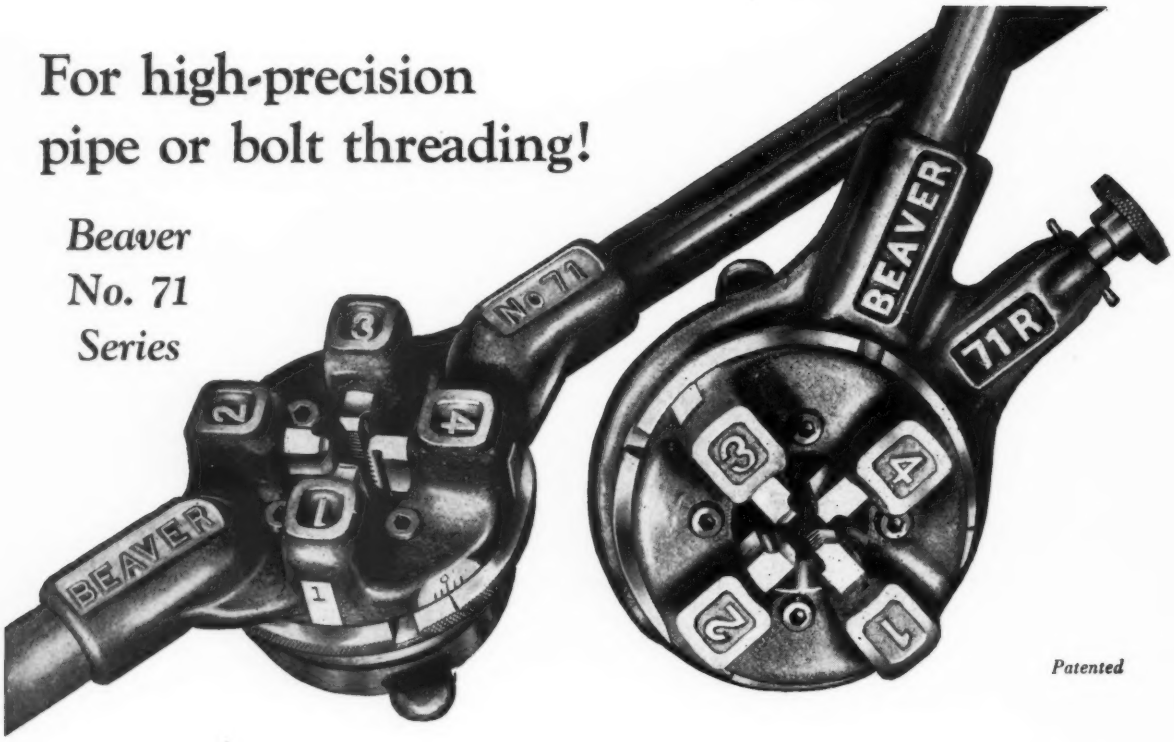
Plant Engineers' Library 40

Bulletins . . . Catalogs 45

Volume 2, No. 7

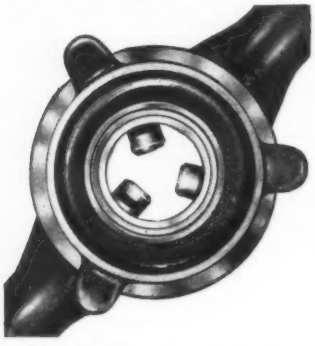
For high-precision pipe or bolt threading!

Beaver No. 71 Series

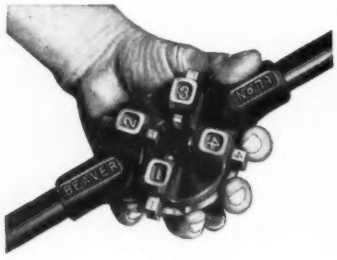


Patented

BEAVER No. 71 (plain) or No. 71-R (ratchet) are built especially for high precision pipe or bolt threading. The tools are patented design and offer such advantages as compactness; simplicity; adjustability for over size or under size threads; immediate chip clearance and easy oiling. The dies can be changed in a matter of seconds—and NO TOOLS REQUIRED. No bushings either—a smooth-working universal chuck accurately centers the tool and insures straight threads. Note that the dies are up on top—so the long curling streamers from soft bolt stock cannot jam or clog these tools. Ideal for hand use—or with modern power units such as Beaver Model C.



No loose bushings to bother with (or lose). A smooth-working universal chuck centers the tools accurately — insuring straight threads.



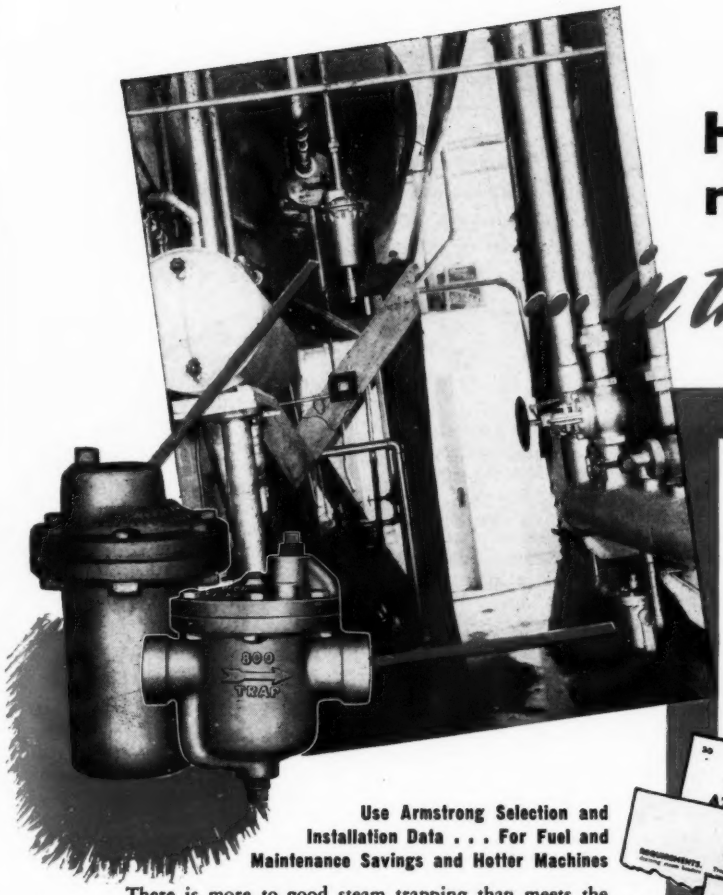
To note its compactness compare a No. 71 with the hand.

See page 6 of New Catalog for full details.

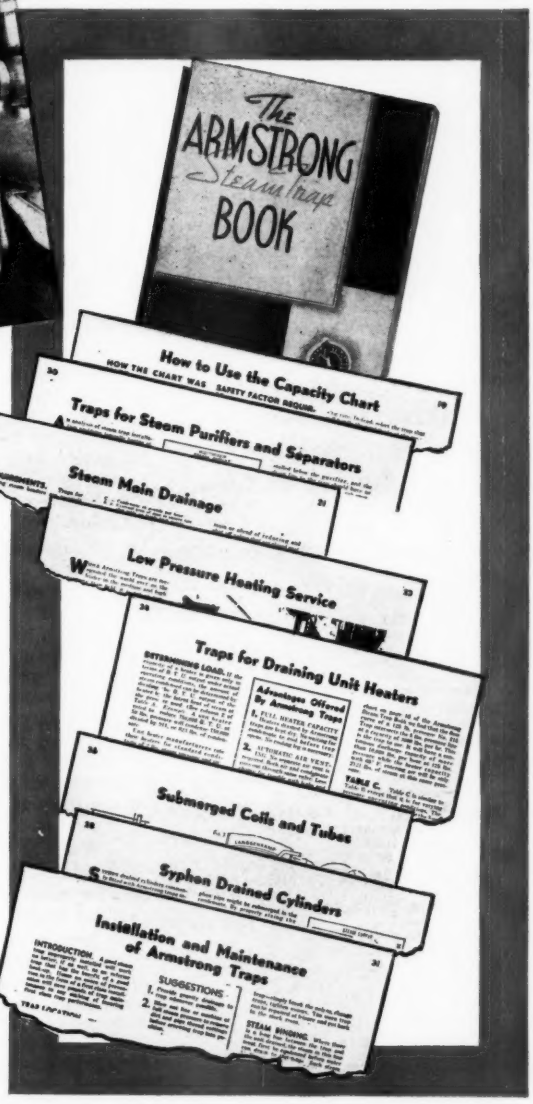
A small metal box is available to hold eight sets of dies—also larger metal kit box which holds a No. 71 or 71-R tool and many extra sets of dies.

BEAVER PIPE TOOLS

210 DIANA AVENUE *Quality Tools—Since 1900* **WARREN, OHIO**



How to get the right steam trap ...in the right place!


The ARMSTRONG Steam Trap BOOK
How to Use the Capacity Chart
Traps for Steam Purifiers and Separators
Steam Main Drainage
Low Pressure Heating Service
Traps for Draining Unit Heaters
Submerged Coils and Tubes
Syphon Drained Cylinders
Installation and Maintenance of Armstrong Traps

Use Armstrong Selection and Installation Data . . . For Fuel and Maintenance Savings and Hotter Machines

There is more to good steam trapping than meets the eye. For example, intelligent trap selection involves not only the normal condensate load but must take into account peak load and the amount of air to be handled as well. The Armstrong Steam Trap Book tells how to figure condensate loads, what to do about large amounts of air and how to determine trap capacity needed for various services. It follows up with actual hot-condensate capacities of Armstrong traps. (Some trap capacity figures are based on cold water ratings, misleading because any trap will handle more cold water than it will hot condensate).

Then, because a properly selected trap won't function efficiently if it is not correctly installed, The Armstrong Steam Trap Book provides complete data on installation practice. But, even the Steam Trap Book can't think of *everything*, so the Armstrong factory and trained sales representatives stand ready to give you a lift on the really tough trapping problems.

These are a few of the reasons why Armstrong traps can be sold on a basis of "COMPLETE SATISFACTION OR YOUR MONEY BACK."

Send for a copy of the Steam Trap Book and plan now to modernize your condensate drainage system with Armstrong traps.

ARMSTRONG MACHINE WORKS
912 Maple St., Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

PLANT ENGINEERING

Published Monthly by
TECHNICAL PUBLISHING CO.
53 W. JACKSON BLVD.
CHICAGO 4, ILL.

EDITORIAL STAFF

RICHARD H. MORRIS
Editor

THOMAS E. HANSON
Managing Editor

CHESTER R. EARLE
Associate Editor

GEORGE V. TEAL
Equipment Editor

EARL NOREN
Assistant Editor

ANDREW W. KRAMER
Contributing Editor

RALPH E. TURNER
Consulting Editor

KINGSLEY L. RICE, *President*
EDWIN C. PROUTY, *Vice President*
WALTER PAINTER, *Vice President*
ARTHUR L. RICE, JR., *Treasurer*
CHARLES S. CLARKE, *Secretary*
RALPH E. TURNER, *Edit. Advisor*
JOHN O. AARVOLD, *Prod. Manager*

RICHARD M. WARD, *Adv. Sales Mgr.*

DISTRICT MANAGERS

CHICAGO: Charles S. Clarke
Arthur L. Rice, Jr.
53 W. Jackson Blvd., Chicago 4, Ill.
Phone: Harrison 0824

NEW YORK: Oscar Wilds
860 Graybar Bldg., New York 17, N. Y.
Phone: Murray Hill 5-3779

PHILADELPHIA: Charles A. Loney
602 Washington Ave., Palmyra, N. J.
Phone: Riverton 8-1285-R

CLEVELAND: A. H. Van Duyn
681 Union Commerce Bldg.
Cleveland 14, Ohio
Phone: Cherry 1377

PACIFIC COAST: Roy M. McDonald & Company
Roy M. McDonald, Mgr.
564 Market St.
San Francisco 4, Calif.
Phone: Garfield 8966

Edwin T. Thompson
639 So. Wilton Place
Los Angeles 5, Calif.
Phone: Drexel 2590

Harry Abney, Mgr.
Terminal Sales Bldg.
Seattle 1, Wash.
Phone: Main 3860

WASHINGTON, D. C., OFFICE:
Business Press News Bureau
National Press Bldg.
Washington, D. C.

Subscription Information—Published Monthly. Prices: United States and Possessions one year $10.00, Canada one year $11.00. Other countries one year $12.00. Single copies $1.00.

Letters from the Readers

This section is open for discussion of: any topic of interest to, or, in the sphere of the plant engineer; pertinent comment on articles published; and suggestions, criticism or commendation. Upon request, name and company connection will be withheld

Paint Planning in General

ANY PLANT engineer, superintendent or architect can secure maximum protection, safety and restfulness for workers—and pleasing color harmony for hotel, department store, office, public building, institution, theatre, factory, hospital, equipment or manufactured product, by thoughtful planning of painting and proper lighting.

Too many times those in charge of such planning use their personal ideas and tastes, without consulting with and considering those of their associates, or the persons most affected. Great help can be obtained, at no cost, from the manufacturers of fabrics, wall boards, floor coverings, lighting fixtures and paints. All of their recommendations might not be acceptable or within your budget but surely you can plan any changes better with the help of those who are well versed in their respective fields.

You probably have observed the variation of design in lighting fixtures of various manufacturers. This applies in most all products, including paint. There is no standard formula for paint manufacture, and the results obtained depend greatly upon the integrity of the manufacturer—plus the knowledge and ability of their technical staff. The advances in paint and varnish chemistry in the past 20 years have been so marked that one must always be on the lookout for improved methods and materials.

World War II brought about the development of new and better protective coatings. Let us all learn from these experiences.

Primers: It is generally agreed that the first coat applied to wood, metal, wall board, plaster, cement or brick—interior or exterior, is of utmost importance. An improper or inferior primer can cause expensive failures. Use the proper one!

Finish Coats: There is no all purpose material which provides best protection for all surfaces. Various types and formulations make for satisfactory results on different surfaces, and under varying conditions.

General: It is therefore advisable to consult those whom you feel can be helpful, come to your own conclusions, write your specifications for the materials you feel will best meet your requirements, and then see that the contractor uses the materials specified and applies them properly. As labor constitutes ¾ of the cost of painting, it is essential that the best material be used.

Some of the troublesome surfaces for which paint manufacturers have developed special protective coatings, are as follows:

Exterior

Smoke stacks; fire escapes; water tanks (steel or wood); wooden vinegar tanks; galvanized iron; cement or cinder blocks; brick; concrete; cemesto board; plywood; wood—to prevent mildew; wood—to prevent rot; traffic lines; roof coating; screens; caulking around windows and doors; rust inhibitor for structural steel.

Interior

Acoustic tile; unglazed ceramic tile; wood floors; concrete floors; storage tanks—steel (different for various products and conditions); brick, cement or cinder blocks and porous surfaces; surfaces subjected to excessive steam, moisture, acid or chemical fumes; to stop condensation on cold water pipes; traffic lines; to prevent bleeding of stains; to prevent mildew; boiler fronts.

Color and lighting:

The proper use of color and light can be beneficial to all concerned, from the standpoint of health, safety, morale and increased efficiency. This is a very broad subject, for which there can be no set rule or formula—due to a variation of personal taste, exposure, use and type of property, and the funds available.

The color specialist of a good paint manufacturer can be very helpful in working out your most practical color scheme for exterior and interior. When painting is to be done, the proper colors can be used with no extra cost.

Carpenter-Morton Co. Silvanus Smith
Boston, Mass. Asst. Treasurer

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A. $11.00 to Canada. $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.

DISCHARGED FROM ACTIVE DUTY

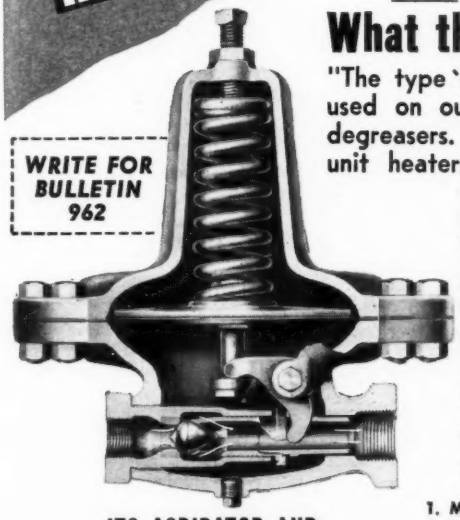
When the '1000' VALVE Goes on the Job . . . . These Troublemakers are THROUGH . . .

CASH STANDARD *Streamlined* PRESSURE TYPE 1000 REDUCING VALVE

What this user says IS PROOF:

"The type '1000' valves we have in our plant are used on our heating system and washers and degreasers. Our heating system is almost entirely unit heaters and with varying conditions, the valves are called on to operate at both small capacities and wide open. When the wind is mild the valves are practically dead ended and when the weather is cold, the valves are called on to open and close very rapidly. On our washers and degreasers we don't have anything else but the Cash type '1000'. Our oldest valves in the plant are seven years old, but they are working perfectly."

WRITE FOR BULLETIN 962



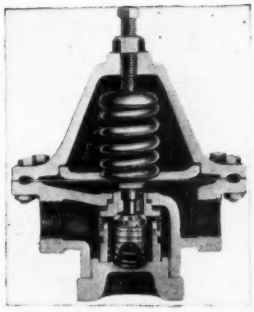
ITS ASPIRATOR AND STREAMLINED FLOW WORK TO YOUR BENEFIT IN THESE 12 WAYS . . .

1. Maximum Capacity when needed most. 2. Accurate Pressure Control under toughest working conditions. 3. Trouble-free Service. 4. Smooth Operation. 5. Tight Closure. 6. Accurate Regulation. 7. Speedier Production Results. 8. Elimination of Failures. 9. Constant Delivery Pressure. 10. Cost Saving Operation. 11. No Spoilage. 12. Practically zero in maintenance costs.

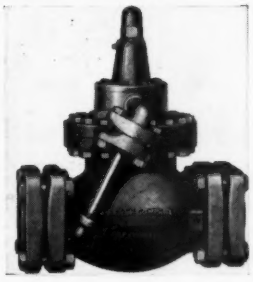
CASH STANDARD CONTROLS . . . VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

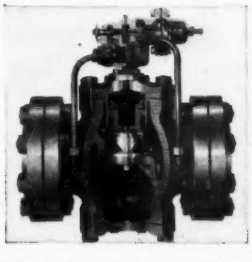
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

New Products and Methods

WHAT'S NEW? Here industrial ingenuity is summarized for your quick review. If you want additional information or have questions on specific applications use the addressed-no obligation, no postage-card between pages 10-11 and 42-43

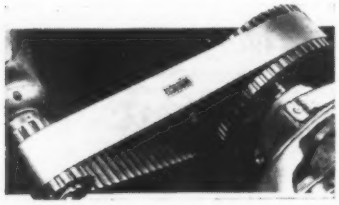
Fog Fire Fighting Nozzle

1 This nozzle is a development for extinguishing flammable liquid fires and is now available for the first time to municipal fire departments, industrial plants, oil refineries, etc. The Type FFF nozzle is available in three sizes for service on 1½, 2½ and 3½ in. hose. The nozzle is equipped with a screen that

discharges a wide protective pattern of fog-foam that can be applied directly to flammable liquid fires. This screen can be easily removed and replaced with a foam shaper which will allow the nozzle to discharge a long range of solid foam stream. With this same nozzle you can shut off the foam liquid supply and obtain an excellent high velocity Waterfog pattern. Rockwood Sprinkler Co.

Belt with Teeth

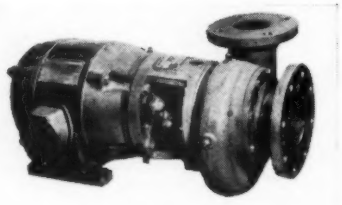
2 A belt with rubber teeth that will not slip is announced. The new belt is said to be strong, highly flexible and virtually noiseless in operation. It is designed for use on machinery equipped with special pulleys grooved to fit the teeth. The belt is reinforced with steel cables embedded in oil-resisting synthetic rubber. The cables reduce stretch



almost to zero, eliminating the necessity of take-up devices installed on many belt drives to remove slack. In operation, the belt makes positive engagement with the pulleys at any speed ranging from a snail's pace to 10,000 fpm. Known as the Gilmer timing belt, the new product will be made in various sizes to meet the requirements of machine designers. It is suitable for power transmission and synchronization. United States Rubber Co.

Unit Pump and Motor

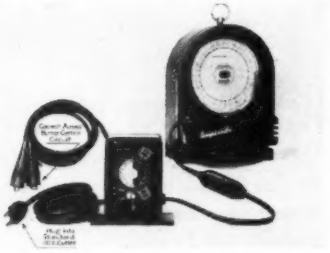
3 These pumps are general service compact pump-motor units for all types of industrial plants. Bilt-on pumps are designed with interchangeability of basic parts. With 8 cases, 8 motors, 9 impellers and a stock of small parts it is now possible to assemble a pump that will handle capacities from 10 gpm to 600 gpm at heads up to 340 ft. There are 322 pump combinations available. The units are particularly easy to assemble



since it has a single shaft common to both pump and motor. For certain capacities and heads, the impellers need to be machined from 1-12 deg. but no other work except assembly is required to meet the ranges described above. Byron Jackson Co.

Timers for Recorder

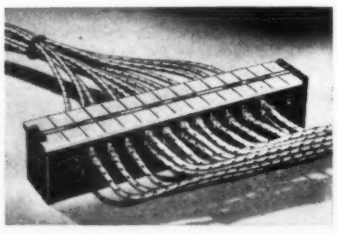
4 Developed is a timer that greatly facilitates use of the Tempscribe Operation Recorder for adjusting fire size of oil burners or input rate of gas burners. With this device it is possible to use the Tempscribe to record burner running time at night, yet set up the recorder



for this test at any convenient time during the day. After the record has been made for the interval preselected for the test, the timer automatically switches off the recorder. The chart may be taken off later, whenever convenient. Bacharach Industrial Instrument Co.

Terminal Block

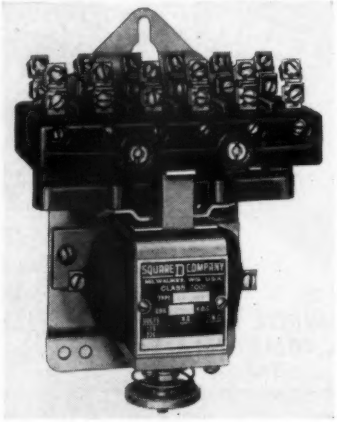
5 Known as the Crablok, this new terminal strip is furnished in several lengths, and in either single or double-tier types as illustrated. The individual strips are simply placed end-to-end to provide any number of connections necessary. The whole assembly consists of: The terminal block molded of light weight phenolic plastic with reinforced barriers between channels. Spring-loaded socket connectors are mounted into channels in the Crablok, either single or double-tier as specified. These socket connectors are available in two sizes to accommodate contact tips for the range of



conductors from #20 through #8 AWG. Contact tips that are indented onto the wires and snap securely into socket connectors. Insulating cover of white, matte-finish plastic which snaps onto terminal block, and also provides an area of identification. In making normal quick-disconnect connections, the contact tip is simply inserted into the spring-loaded socket connector which grips the tip firmly and provides a highly efficient electrical connection. Where desired, however, positive locking of the connection is quickly accomplished with a screw driver. The Crablok is normally used in 220 v service, but can be safely used for higher voltage service up to 600 v by insulating the contact tips with plastic sleeves. Burndy Engineering Co.

D C Relays

6 Two new d c magnetic multi-pole relays have been announced. The new relays utilize double-break, silver-to-silver contacts, which are readily converted from normally open to normally closed without additional parts or tools.



The contact parts are interchangeable with those of the corresponding a c devices, permitting a minimum inventory and simplifying the maintenance of combination a c —d c control panels. The relays are steel panel mounted and insulated to permit direct mounting on a grounded metal panel. All terminals are accessible from the front and are equipped with two wiring clips to accommodate the multiple connections which are characteristic of complicated control circuits. The new relays are designated as Types Q and R. The Type Q is available with from 2 to 6 poles, and the Type R, somewhat larger and heavier than the Type Q, is available with from 2 to 5 poles in any combination of normally open and normally closed circuits. Both relays are suitable for operation on d c voltages up to 250. Square D Co., Industrial Controller Div.

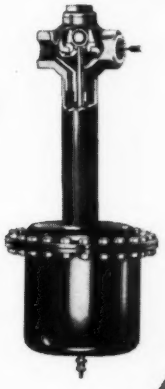
Pressure Control Pilot

7 A new differential pressure control pilot for meeting the needs of a number of applications, has just been announced. Designated as Types DD-1 (Direct Acting) and DR-1 (Reverse Acting), these new control pilots provide constant differential pressures for process work. The operating medium which is used to control a suitable diaphragm regulating valve, may be air, clean water, oil or gas.

(Continued on page 10)

Klipfel

AUTOMATIC REGULATING VALVES



FOR ACCURATE REGULATION *Always*

Nothing seats like a ball

Get all the advanced features of Klipfel No. 431 air-loaded, ball type reducing valve. It's dependable for closer regulation . . . greater capacity and durability.

Hardened stainless steel ball inner valve and seat are self-aligning, tight-seating and streamlined. Accessible and durable, valve is non-sticking. Air loading in drawn steel dome varies from vacuum to 150 P. S. I. for corresponding reduced pressure. Constant loading pressure from closed to full open.

Clear neoprene diaphragm balanced between equal pressures. Pitot tube in valve body . . . no external control pipe needed. Suitable for any ordinary fluid below 250 P.S.I. initial pressure . . . vacuum to 150 P.S.I. reduced pressure.

Sold through wholesalers everywhere.

For complete details, write Dept. BC-7 for Bulletin 146.

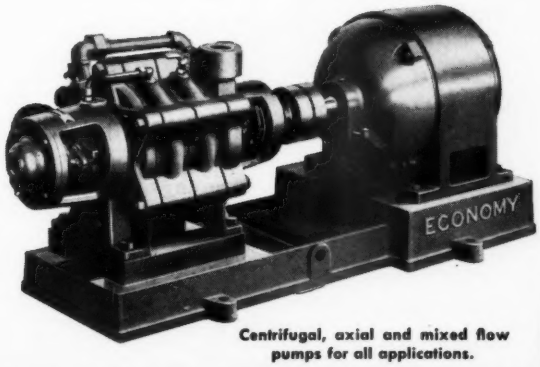
KLIPFEL MANUFACTURING COMPANY
Hamilton, Ohio

For your small capacity, high pressure requirements... ECONOMY

For general water supply, boiler feeding, brine circulation or any clear liquid pumping at pressures up to 200 pounds . . . capacities from 10 to 75 G. P. M., rely on Economy type NAS pumps.

These vertically split-case, small multi-stage pumps have bronze enclosed impellers of the single suction type, carefully machined and balanced. Impellers and alloy steel shaft supported between two outboard ball bearings. Large grease reservoir for ample lubrication. Liberal depth stuffing box fitted with adjustable bronze glands.

For complete details write Dept. BC-7 for Bulletin B346.



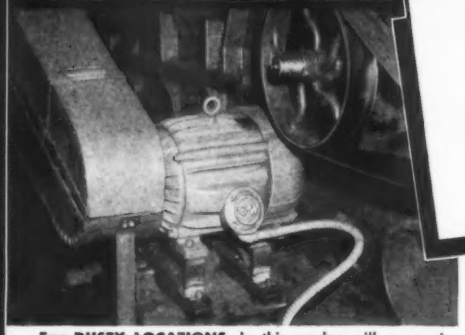
Centrifugal, axial and mixed flow pumps for all applications.

Economy Pumps Inc.

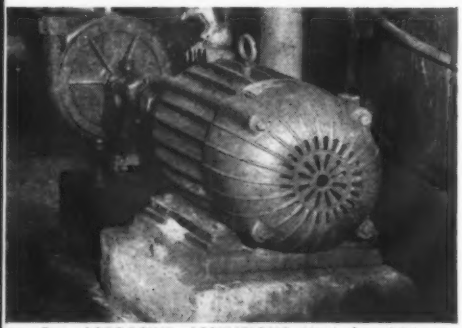
HAMILTON, OHIO

Compare the Maintenance Saving

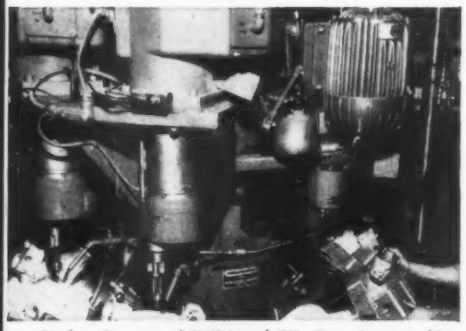
IT'S A STOCK MOTOR
"MADE-TO-ORDER"
FOR THE TOUGHEST SERVICE



For DUSTY LOCATIONS In this woolen mill, even airborne lint is no problem. It can be cleared from the air grille of the fan cowl, or the cowl vent, with a whisk of a brush while the motor is running.



For CORROSIVE CONDITIONS Used for driving a chemical pump, this SEALEDPOWER motor convincingly demonstrates the high resistance of the sturdy cast iron frame to corrosion.



Under showers of CHIPS and OIL Powering a machine tool, this SEALEDPOWER motor proves its effective seal against chips, splashing oil or coolant, vapors, or dust.

FOR ANY APPLICATION WHERE
EXCESSIVE MAINTENANCE IS INDICATED
—specify SEALEDPOWER and SAVE

You'll Agree THERE'S NO OTHER MOTOR LIKE THE

C-W SEALEDPOWER

TOTALLY-ENCLOSED....FAN-COOLED MOTOR

"Time-out for clean-out" is the bugbear that boosts maintenance of most totally-enclosed, fan-cooled motors. But "time-out" is designed out of the C-W SEALEDPOWER Motor. Because there are no easily-clogged, hard-to-clean internal ventilating passages, you don't have to take it apart to clean it.

ONLY THE SEALEDPOWER MOTOR has exterior cooling, with the fan driven airstream blowing over the finned frame, carrying dust and fumes *outside* and *away*.

IT'S A PRODUCTION BOOSTER! You can install a SEALEDPOWER and forget it . . . it cleans itself. Even under extremely dirty conditions, the SEALEDPOWER keeps production going many times longer than "ventilating passage" motors without a shut-down for cleaning. Just figure the production time gained.

CONTINUOUS COOL-RUNNING EFFICIENCY The exclusive outside fin construction provides over 150% *more* cooling surface. And cool operation is continuous, year after year, because no blanket of dust can pile up to block escaping heat.

BEATS RUST AND CORROSION The frame of the SEALEDPOWER is rugged *cast iron,* for highest resistance to conditions of excessive moisture and corrosion. There is no steel to rust. Vital operating parts are sealed securely in a pocket of clean air.

SEALEDPOWER is now available in new ratings . . . 3 to 40 hp . . . horizontal and vertical with NEMA "C" face, "B" or "D" flange mountings. Talk over your motor needs with a Crocker-Wheeler representative. Or, write for descriptive data on Crocker-Wheeler AC and DC motors and generators, and flexible couplings.

Protected-Type Motors

Sealedpower Motors

Wound Rotor Motors

Direct Current Motors

Generators

Flexible Couplings

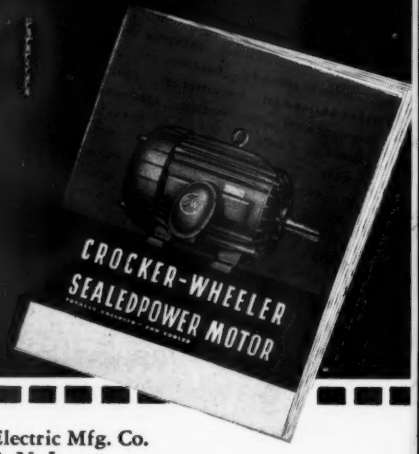
# of 80% and more!

150% MORE COOLING SURFACE
is provided by the radiating fins, exclusive with the C-W SEALEDPOWER. Here, fluttering streamers trace the fan-driven airstream that blows dust and fumes outside and away.

CROCKER WHEELER
ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.
A Division of The Joshua Hendy Corporation

Branch Offices:
Boston, Chicago, Cincinnati, Cleveland, Los Angeles, New York, Philadelphia, San Francisco, Pittsburgh, Washington, D. C. — Representatives in principal cities.

QUALITY MOTORS AND GENERATORS SINCE 1888



Before You Buy ANY totally-enclosed motor, be sure to read why SEALEDPOWER will prove a "maintenance miser" for you. This new booklet, "It's Different—it's a Dollar-saver," is packed with facts no savings-minded motor user can afford to overlook. Write for it.

Crocker-Wheeler Electric Mfg. Co.
Ampere 3, N. J.

Send the SEALEDPOWER Motor Booklet, *"It's Different—it's a Dollar-Saver"*.

PE748

Name.....

Title or Function.....

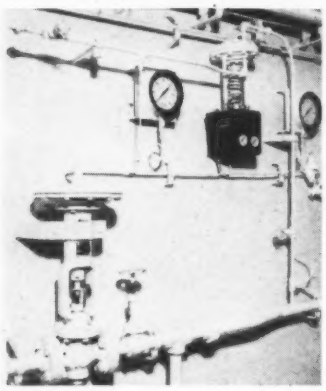
Company.....

Address.....

New Products and Methods

(Continued from page 6)

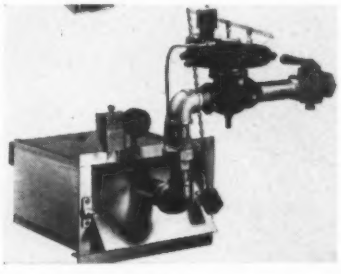
There are three differential pressure ranges, ½-6 psi, 2-20 psi, and 15-75 psi. Maximum total static pressure for all types is 300 psi based on continuous operation and provided both pressures are maintained within differential range of pilot. When controlling



a differential between two pressures, the maker states the higher pressure impulse is applied to the upper side of the diaphragm of the control pilot, and the lower pressure impulse to the lower side. A simple turning of the adjusting nut increases or decreases the differential within the adjustable range. Leslie Co.

Packaged Gas Burners

8 Five sizes in the series SP Gas Burner provide a range from 150,000 to 2,000,000 Btu for steam and hot water supply boilers, and special heat applications. The use of stainless steel in the mixing plate eliminates one major cause of shut-down. Multiple-orifice burner



tips, also of stainless steel, break the gas into a fine spray and permit a more intimate contact with the air necessary for combustion, and produce a more efficient radiant flame. Series SP burners come in five sizes, with 5, 9, 14, 20 or 26 tips and may be used with natural gas, manufactured gas, or liquid petroleum gas-air mixtures of approximately the same Btu content as natural gas. B. P. Lientz & Co.

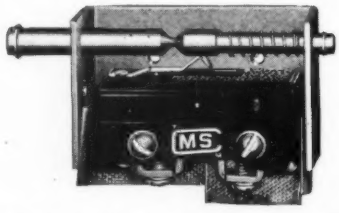
Small Time Switch

9 A new handy time switch, Type T-47, rated 35 amp at 115 and 230 v and timed and operated by the synchronous, self-starting, permanently lubricated Telechron motor, has been announced. The new switch finds application in small industries for controlling ovens and other small equipment. Designed for on and off timing of a single circuit, the new switch will perform one on and one off operation during any 24 hr period and will continue to do so daily without adjustment. The switch has a single-pole, single-throw mechanism with large, silver, snap-action contacts. It is equipped with a large clock dial easily read and adjusted. Operation can be manual or automatic. Adjustable, switch-tripping clamps permanently attached to the dial are used for setting the switch for automatic operation. These clamps allow a minimum setting of five minutes and a maximum setting of 22 hr between on and off operations. Man-

ual operation of either on or off is possible independently of automatic settings already placed on the dial. The switching cycle is resumed automatically after the hand operation is completed. Price $12.45 retail. Meter and Instrument Div., General Electric Co.

Inter-Lock Switch

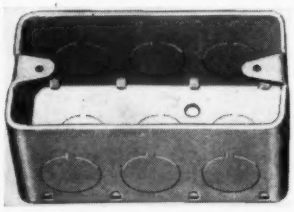
10 Announced is a new interlock door switch. This switch assures positive safety as it automatically cuts off the power circuit when the cabinet door is opened. This enables personnel to repair or test equipment in complete safety



when the cabinet door is open. In addition —and this is the important safety feature of the 1AC1 switch—a service man can close the circuit for servicing or checking by manually moving the actuator without the hazard of forgetting to reposition the switch to the safe condition, as the next door-closing returns the actuator to the normal position. This provision eliminates the necessity of tying-down a conventional switch or putting a jumper across the terminals which may be forgotten at the completion of the service operation. Provision is made for mounting on two faces and the actuator rod has a deep threaded hole for acceptance of an adjustable length actuating pin or button. The 1AC1 switch is single pole double throw for versatility in circuit design. The switching element is listed at 10 amp, 125 v, a c; 5 amp, 250 v, a c; 3 amp, 460 v, a c. Micro Switch

Flush Utility Box

11 The new No. 2020 Redege flush device utility box is formed of pressed steel, the new box is said to provide more finger room through a square corner design of its full gauge steel walls. Rocking is declared to be eliminated by a smooth, flat back. Ears have been made integral parts of the box, which is electro-galvanized throughout. The Redege flush device utility box is 1⅞ in. deep, 4 in. long and 2⅛ in. wide. Eleven, flush, smooth ½ in. knockouts are provided, 3 on the bottom, 3 on each side, and 1 on each box end. Underwriters Laboratories, Inc., approved. The lugs are tapped on 3½ in. centers for all standard makes of push button, rectangular rotary switch and flush convenience outlets. The new utility box can be installed with all types of wiring,



including rigid heavy conduit, non-metallic sheathed cable, armored bushed cable and flexible steel conduit. National Electric Products Corp.

Two Marking Inks

12 Announced are two complete lines of fast drying marking inks for machine or manual marking on any surface, including asphalt or creosoted surfaces. Machine marking inks are available in a wide range of colors. These have been developed especially for automatic, semi-automatic and manual marking devices, using rubber or steel type. Ink may be fed by felt or metal rollers. Manual marking inks are available in a wide range of colors for free hand marking, stenciling or spraying. May be used with marking brush, stencil brush or spray gun. Can also be thinned to use with pen point for fine markings. Both marking inks are fast drying. They are waterproof, weatherproof, fade resisting, oil, solvent, acid and alkali resisting, and are made to stand severe handling. Neehi Protective Coatings, Inc.

Scaling Hammer

13 A new high speed and powerful scaling hammer, the Model M-205 and M-206, is now available for such scaling tool operations where a small, light weight, and fast percussion type pneumatic tool is required. Features are: light in weight; simplicity of design;

lower air consumption; easy feathering of throttle control in both lever type and push type throttles; sure grip body contour permits operator to better control his work; simple self-seating type of valve which seats perfectly for the life of the tool; positive locking-device of back head keeps valve mechanism sealed against air leakage and dirt. Master Pneumatic Tool Co.

Masonry Coating

14 Aquaphane is a transparent protective coating applied to common brick and porous masonry walls. Its purpose is to prevent penetration of rain, dampness, snow, sleet and water. It consists of highly dispersed water repellent organic ingredients. In emulsion form it has a milky white appearance but after application it is said to be absolutely transparent. It is stable as an emulsion at temperatures ranging from 40 to 160 F. Recommended storage temperature at 50 F or more. As a coating, it will withstand temperatures up to 212 F, is non-toxic and non-inflammable, and contains 14 per cent solids and weighs approximately 8 lb to a gal. Aquaphane is applied by ordinary brush to such masonry surfaces as un-

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10-11 and 42-43

NEW, SIMPLIFIED METALLIZING SAVES MONEY

Do You Know How This Brand New Metallizing Development Might Help Cut Your Repair Costs?

FREE—Metco Booklet Tells How "Metallizing Saves Money" by . . .

- cutting replacement costs
- cutting repair time
- cutting metal consumption
- cutting "down" time
- increasing wear resistance
- improving lubrication
- increasing protection
- cutting hard surfacing costs

It's packed with facts and figures —and actual photographs of a wide range of money-saving, part-improving jobs. Send for your copy today.

METALLIZING ENGINEERING CO., INC.
38-14 30th Street, Long Island City 1, N. Y.
Please send me, without obligation, "Metallizing Saves Money."

Name_____

Company_____

Street_____

City_____ Zone____ State_____

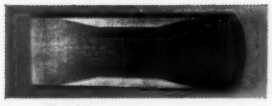
New Bond Makes Metallizing Easy

Now, no roughening—no grooving—no dovetails required; only a rough cleaning cut and a light coat of Sprabond—Metco's new self-bonding wire—prepares most parts for metallizing, with any of 32 metals available in Metco Wire.

You can apply long-wearing and corrosion-resistant coatings on inexpensive base metals—bronzes, monel, stainless, high carbon steels on ordinary carbon steels, for example.

It's Fast—It's Foolproof—It's Economical

Cut-away view showing typical build-up over Sprabond preparation coat on steel shaft.



Low Heat Eliminates Danger of Warpage

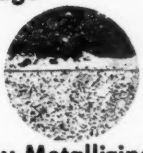


Photo-micrograph (magnification 100x) of .10 carbon steel applied over Sprabond preparation coat on mild steel base. As sprayed metal particles land, they flatten and fuse with the surface and with each other, cooling almost instantly.

Parts Like These Repaired Quickly and Easily by Metallizing

Pump Shafts • Crankshafts • Motor Shafts • Turbine Shafts • Transmission Shafts • Worm Shafts • Spindles • Lathe Beds • Pump Plungers • Impeller Shafts • and many other machine parts.

One Quick Way To Find Out

If you'd like to know more about how this modern repair process can help cut machine maintenance costs in *your* plant, just send your next machine repair job to your local metallizing-equipped job shop. If you do not know him, or can't locate him in your Classified Directory, we'll be glad to send you his name.

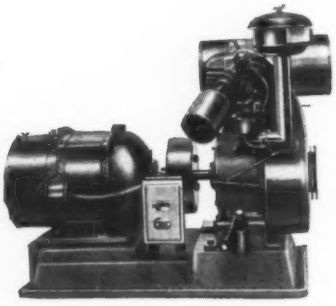
METALLIZING ENGINEERING CO., INC.
38-14 30TH STREET LONG ISLAND CITY 1, N. Y.

New Products and Methods

glazed brick, stone, concrete, cement, stucco, mortar, plaster, asbestos, fibre, cement shingles, sheeting, etc. International Aquella Products, Inc.

Automatic Power Plant

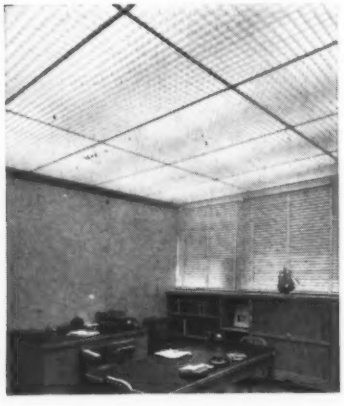
15 A new, fully automatic light and power plant provides 1750-2000 watts, 115 v, 60 cycle alternating current. Model 2100-BA incorporates automatic operation with all controls entirely enclosed in two small metal cabinets, one



mounted on the unit and the other on the wall. No complicated connections are required for installation, as the two metal cabinets are completely wired at the factory and interconnected. To place the plant in service it is only necessary to connect the load wires to the proper terminals and hook up a starting battery. A high rate or a low rate charge is available for the batteries which are charged automatically. Whenever any light or appliance of 25 watts or more is turned on, the plant automatically starts and continues operation until the last light is turned off. Similar automatic plants are available in a range of from 700 to 6000 watts. Universal Motor Co.

Luminous Ceiling

16 Sky-Glo makes possible the conversion of an entire ceiling into a lighting unit. The system consists of standardized stock sections of louvers, channels, and fittings. It is said to afford modern streamlined luminous ceilings by providing a practical way to conceal pipes, ducts, and the individual lighting fixtures. The Vinylite louvers do more than reflect the light. Having a light transmission factor of approximately 71 per cent, they are said to glow with light. The standardized louver sections and fittings make the system extremely easy to lay out and install. There are four sizes of louver sections, which make possible geometric arrangements providing wide flexibility of design for various sizes of ceilings. Benjamin Electric Mfg. Co.

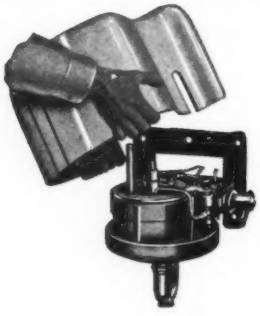


Insulating Varnish

17 A new insulating varnish which the company states possesses the best combination of electrical, mechanical and chemical properties ever attained in a general purpose varnish, made by this firm, has been announced. Designated as general purpose varnish No. 9574, the new material can be used with practically all types of winding including enamel, cotton, asbestos, and glass covered wire. A thermosetting, phenolic drying-oil varnish, No. 9574 cures to a tough, pliable mass even in the deepest coils. It is said to give exceptional resistance to oil, acid, alkali, salt water, moisture, and heat, and is suitable for infra red baking. Possessing excellent aging properties, it has good build and flexibility, and imparts excellent dielectric strength. It has a flash point of 100 F and its viscosity at 45 F is 600 C. P. average. The insulation varnish can be used at barrel gravity or can be thinned up to 20 per cent with petroleum spirits or any other available commercial thinner. Resin and Insulating Materials Div., General Electric Co.

Bubbler Fountain

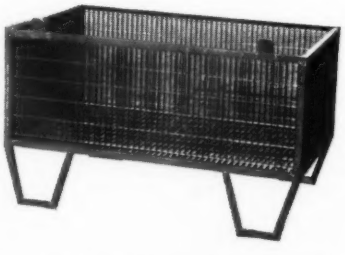
18 Model 122 wall fountain has a cooling capacity of 18 gal per hr, cooled from 80 to 50 F when connected to a refrigerating compressor of proper size. The fountain has a 2 stage drain to provide positive draining. The water is cooled at the bubbler, not in the



basement. A temperature adjustment permits regulation of coolness of water to suit the working conditions of the personnel. The entire porcelain fixture can be removed by removing the bubbler and lifting the fixture, thus exposing the cooling unit and regulator. Due to the fact that the compressor may be located at a distance there is no noise from the fountain. Tal-Co Mfg. Co.

Steel Pallets

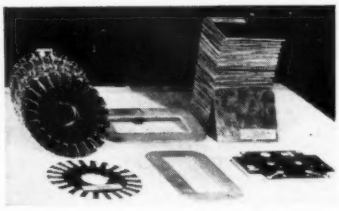
19 A new line of steel pallets with several advances in design is announced. These pallets are built of grating bars set on edge for greatest strength; with bars, bottoms, side supporting angles and lifting straps welded together. The pallets are designed for 8 way lifting by fork truck; that is, at any of the four sides or four corners, and all corners are rounded to prevent catching on materials in aisles. A complete line of these pallets is available, either plain or with closure; and tote boxes of the same design are also built. Kerlow Steel Flooring Co.



Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10-11 and 42-43

Plastic Laminate

20 A new fiberglass-reinforced industrial plastic laminate designed for elevated-temperature electrical applications is announced. As insulating panel stock, the laminate will stand long exposure to high temperature without embrittlement or blistering. This area will



conduct current only poorly and without following any definite track. The carbonized area will be on rather than in the material and can be removed by wiping with a cloth, thus restoring the original surface characteristics. The Glastic laminate is well suited for use as slot sticks, because of its ability to retain its physical properties at high temperatures. Strip stock can be cut with ordinary shears, and the edges of the slot sticks can be chamfered with conventional chamfering tools; or in repair shops, with ordinary hand tools. The slot sticks can be driven into armature coil slots without spreading the ends of the sticks, and without risk of snapping due to buckling. Glastic is available in thicknesses from ¼ to 1 in. and in sizes from 12 by 18 to 36 by 42 inches. Owens-Corning Fiberglas Corp.

Powered Wheelbarrow

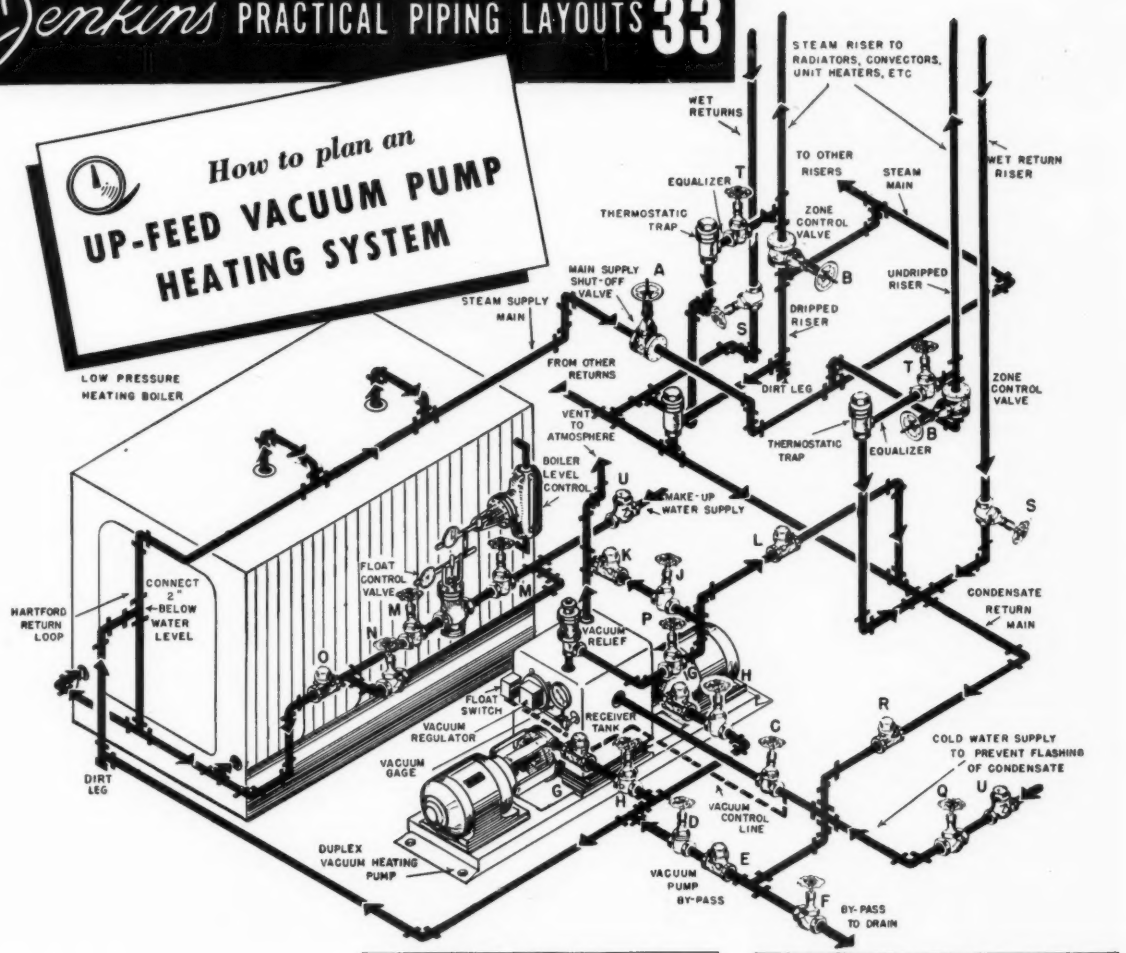
21 A capacity of 1000 lb of wet or dry materials and the ability to climb a 20 per cent grade with full load are features of the Prime Mover. The machine has three wheels, is power operated and can be equipped with a

bucket or a sturdy steel and wood platform deck. A snow plow attachment is also available. The unit has a 3 hp air-cooled engine and operates for eight hours on three gallons of fuel. Transmission, clutch and gears are completely enclosed and no belts or chains are used to transmit power from the engine. The bucket has a capacity of 10 cu ft and the addition of sideboards raises the capacity as high as 18 cu ft for lighter materials. The bucket is quickly interchangeable with the spacious platform deck, without use of tools, thus providing two features which permit efficient handling of almost every type of material. Both the platform and the bucket dump automatically, and then return to a level, locked position. Weighing slightly more than 400 lb, the Prime Mover is 35 in. high, 63 in. long and 31½ in. wide. It turns in its own radius, passes through ordinary size doorways and operates in close quarters and narrow aisles. Bell Aircraft Corp.

(Continued on page 42)

Jenkins PRACTICAL PIPING LAYOUTS 33

How to plan an UP-FEED VACUUM PUMP HEATING SYSTEM



Code	Quan.	Jenkins Valves	Service
A	1	Fig. 651 IBBM OS&Y Gate	Main Steam Supply Shutoff
B	2	Fig. 651 IBBM OS&Y Gate	Zone Control Valve
C	1	Fig. 370 Bronze Gate	Condensate Return to Receiver Tank
D	1	Fig. 370 Bronze Gate	Receiver Tank By-pass
E	1	Fig. 92 Bronze Swing Check	Prevent Backflow when Pump Used
F	1	Fig. 106-A Bronze Globe	Drain Condensate
G	2	Fig. 92 Bronze Swing Check	Prevent Backflow through Pumps
H	2	Fig. 370 Bronze Gate	Vacuum Pump Shutoff
J	1	Fig. 370 Bronze Gate	Vent By-pass of Pressure Relief Line
K	1	Fig. 92 Bronze Swing Check	Prevent Air Entering Relief Line

Code	Quan.	Jenkins Valves	Service
L	1	Fig. 92 Bronze Swing Check	Prevent Condensate Flow to Relief Valve
M	2	Fig. 370 Bronze Gate	Shutoff Float Control Valve
N	1	Fig. 106-A Bronze Globe	Manual Level Controller
O	1	Fig. 92 Bronze Swing Check	Prevent Backup of Condensate to Make-Up
P	1	Fig. 370 Bronze Gate	Relief Line Shutdown
Q	1	Fig. 106-A Bronze Globe	Cold Water Supply to Prevent Flashing
R	1	Fig. 92 Bronze Swing Check	Prevent Backflow in Condensate Line
S	2	Fig. 370 Bronze Gate	Condensate Riser Shutoff
T	2	Fig. 370 Bronze Gate	Equalizer Shutoff
U	2	Fig. 352 Bronze Check	Prevent Backflow

Because of its efficiency, an Up-Feed Vacuum Pump Heating System is often installed in multi-storied apartments, industrial plants, institutions, office and loft buildings.

Steam can be supplied by a low pressure boiler, as shown, or taken off a high pressure main line through a pressure reducing valve. Steam from the boiler goes to heating units through risers. These may or may not be dripped, according to the original design. Both types are illustrated here.

The pump, controlled by a float and vacuum regulator in the receiver, discharges the air from the system through a vent, and returns the condensate to the boiler for re-use. For this reason, thermostatic traps which will pass both air and condensate must be used on return lines.

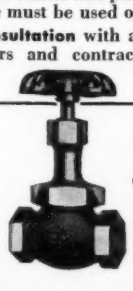
Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation. Copies of Layout No. 33, enlarged, with additional information, will be sent on request. Just mail coupon.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized engineering experience, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

Jenkins Bros., 80 White Street, New York 13; Bridgeport, Conn.;. Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

LOOK FOR THIS JENKINS TRADE MARK **DIAMOND MARK**
Since Jenkins Bros. *1864*



JENKINS VALVES

For every Industrial, Engineering, Marine, Plumbing-Heating Service . . . in Bronze, Iron, Cast Steel, and Corrosion-resisting Alloys . . . 125 to 600 lbs. pressure.

Sold Through Reliable Industrial Distributors Everywhere

JENKINS BROS., 80 White Street, New York 13, N. Y.
Please send me a reprint of Piping Layout No. 33.

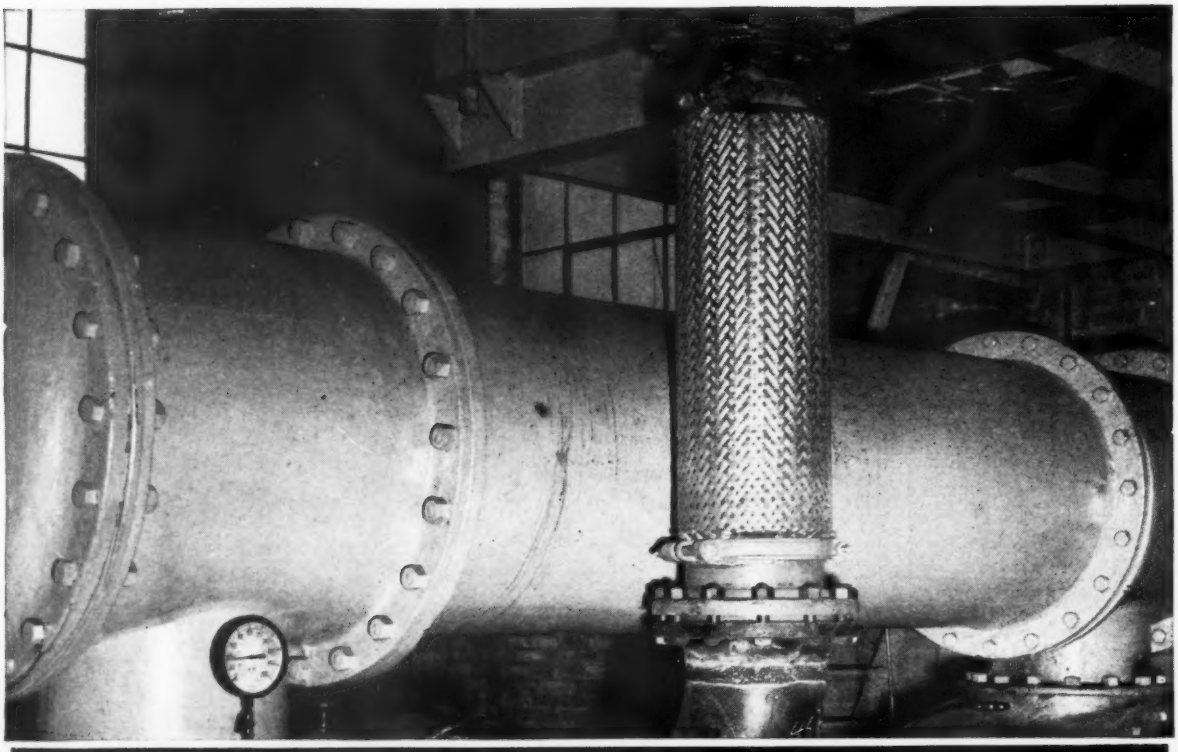
Name.....

Company.....

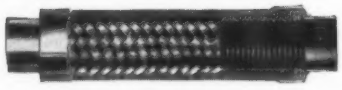
Address.....

.....

Isolate compressor vibration



with REX Super-Service VIBRA-SORBERS



REX VIBRA-SORBERS are scientifically corrugated flexible hose with bronze braid. They are available in bronze or steel with straight extended tube ends or with threaded fittings. Special units with bent extended tube ends for angle installations are also available.

In refrigeration or air conditioning systems . . . in connecting lines of pumps, turbines and allied equipment . . . wherever it is necessary or desirable to prevent transmission of vibration or noise into rigid piping, Rex Super-Service Vibra-Sorbers offer dependable control. Leak-tight and fatigue-resistant Vibra-Sorbers reduce piping maintenance and assure minimum noise transmission.

"FLEXON" Identifies CMH Products, which have served industry for more than 45 years.

"the science of FLEXONICS . . ."the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion"... is exemplified in the basic products of Chicago Metal Hose Corporation.

Write for data sheets giving detailed information on Rex Vibra-Sorbers . . . it's the first step toward vibration control.

CMH FLEXIBLE METAL HOSE

CHICAGO METAL HOSE CORPORATION

Maywood, Illinois

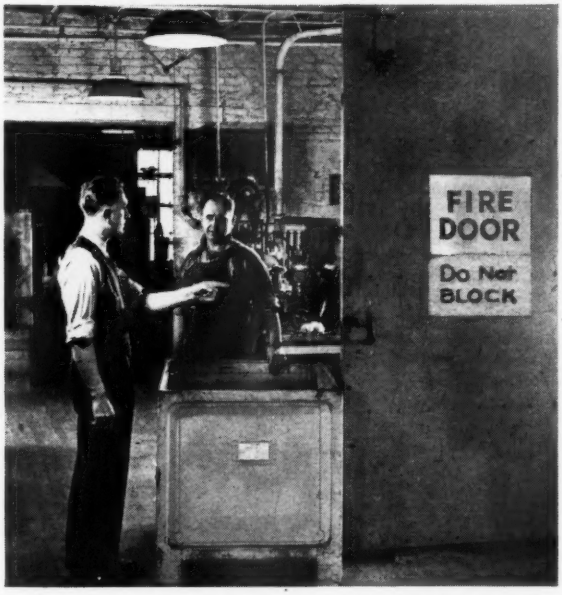
Plants at Maywood, Elgin and Rock Falls, Illinois

Safety Crimes

There are many points to observe in the practice of safe operation and work . . . All of them are based on common-sense rules of self-preservation and regard for the other man . . . Sharp tools, heavy weights and packages, moving machinery, slippery or dirty floors and fire hazards all present opportunity for the careless worker to lose time, money or life and limb . . . Don't be a sucker—be safe in every move!

For foot protection wear safety shoes when you handle castings, crates, or other heavy material

No Smoking signs mean just that—they are put there for everybody's protection. Smoke only in areas which have been designated as safe. Safety, like freedom, is everybody's job



Pictured here is another danger. Don't block fire doors. Keep aisles, fire escapes and stairways clear. Never make an exception because that exception may mean your life

Photos: National Safety Council

Above: Interlock wire coils, sacks and bags when lifting. Right: A disposal box for empty bottles will prevent many falls

To Eliminate FIRES: Eliminate the CAUSES

Given in this article is a listing of the major causes of fires in industrial plants . . . The necessities for good housekeeping . . . Establishing special safeguards for special hazards . . . Good electrical and machine maintenance . . . Handling combustible and toxic-materials

By O. W. STEWART, *Manager, Inspection Department,*
Associated Factory Mutual Fire Insurance Companies

TO ELIMINATE fire causes, it is important to know the many ways in which fires can start. The following briefly outlines certain broad principles of fire prevention, based on a study of 19,485 fires in Factory Mutual plants over a 7-year period.

Fires caused by **electrical equipment (19 per cent)** lead the list of industrial fire causes. Electrical equipment is normally well designed and carefully installed. The trouble arises from lack of proper maintenance or from the use of wrong-type equipment in hazardous areas.

Friction (14 per cent) causes fire at hot bearings, misaligned or broken machine parts, choking or jamming of material, poor adjustment of power drives and conveyors. The remedy is a regular schedule of inspection, maintenance and lubrication.

Foreign substances (12 per cent) cause fires mostly at processes involving fibers or dusts. Tramp metal produces sparks in machines, at cotton mills particularly. The remedy is care in keeping stock clean, and removal of foreign metal by magnetic or other separators.

Open flames (9 per cent) are a constant source of ignition and therefore a constant threat to the safety of a plant. Keep burners properly adjusted and surroundings clean. Avoid use of open-flame torches near combustibles. Cutting and welding (particularly molten globules), and similar torches also cause many fires. Follow recognized rules for cutting and welding.

Smoking and matches (8 per cent) is dangerous practice wherever material can be ignited. The remedy is prohibition in such areas, with smoking permitted only in safe places under regulations understood by all, and rigidly enforced.

Spontaneous ignition (8 per cent) occurs in oily waste and rubbish deposits in dryers, ducts and flues, in storage of low-grade materials and industrial wastes. Remove waste daily, clean ducts and flues frequently, and isolate storages subject to spontaneous heating.

Hot surfaces (7 per cent) cause fires when combustibles are exposed to the normal heat from boilers and furnaces, hot ducts or flues, electric lamps or irons. Hot metal being processed also

Fig 1. Sparks from cutting torches can, and often do, ignite combustible materials. Open flames of any type are a constant threat to the fire-safety of any plant

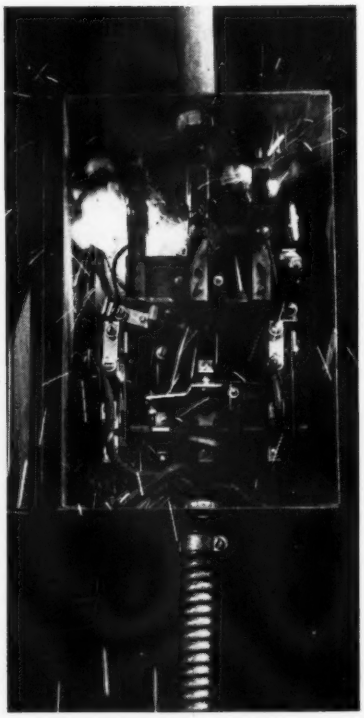


Fig. 2. Covers of boxes holding electrical equipment should be tightly latched

may ignite combustibles. Provide ample clearances, insulation, and air circulation. Check when leaving heated apparatus unattended. Arrange hot-metal handling to avoid igniting combustibles or quench baths.

Combustion sparks (6 per cent) from rubbish burning, foundry cupolas, engine stacks, furnaces and fire boxes, and from process equipment are a fire hazard at any plant. Use well-designed and well-constructed combustion chambers, tightly enclosed, with spark arresters on stacks as needed. Use care in burning waste materials.

Overheated materials (3 per cent) catch fire due to abnormal process tempera-involving heated flammable liquids and material in dryers. Careful supervision and competent operators, supplemented by well-maintained automatic temperature controls, are required.

Static electricity (2 per cent) is dangerous where flammable vapors may exist. It is controlled by grounding, static eliminators, and humidification.

Miscellaneous (5 per cent) causes include fires communicating from nearby properties, fires caused by molten substances, lightning, chemical action, and incendiarism.

In 7 per cent of the fires evidence was entirely lacking, too conflicting, or insufficient to warrant definite conclusion.

Good Housekeeping

Maintaining clean and orderly conditions is more important than any other single thing in keeping a plant free from the outbreak of ordinary fires. Accumulations of waste materials provide ready fuel for fire from any source of ignition. Some waste materials ignite spontaneously.

Fire-breeding conditions of this kind can be prevented by the frequent removal and safe disposal of waste or rubbish in all locations, but especially at (1) machines, under tables or benches, under stairways, and in machine or elevator pits, (2) lint or combustible dusts and deposits on machines, beams, walls, and fixtures, (3) combustible residues in spray booths, exhaust ducts, under hoods, and in other process equipment, and (4) oils or grease on floors or woodwork.

A regular and frequent cleaning schedule is a "must" in every well-managed plant. Approved covered metal cans should be provided for refuse and these cans emptied daily.

Processes producing combustible dusts, oil vapors, or spray residues need adequate exhaust and collecting systems to prevent dangerous accumulations inside the plant. Good working conditions and better production go hand-in-hand with greater fire safety when a plant is kept clean, orderly, and uncrowded.

Modern large-scale industrial methods have brought manufacturing plants many serious fire and explosion hazards that require special protection. The advice of fire protection engineers should be sought when a potentially hazardous operation is in the blueprint stage. Processes involving unusually severe hazards should be isolated; a separate detached building is frequently advisable. If the process must be located in a main building, provide an appropriate enclosure. Avoid locations on upper floors, above important stock or processes that might suffer from floor leakage.

Fig. 3. An overheated bearing can also cause ignition of combustible deposits of grease, lint and other substances which cling to its outer surface

Flammable liquids are widely used—in dip tanks, ovens and dryers, and mixing, coating, spraying, and other processes—and are always dangerous. Vapors mixed with air are explosive and can be set off by a spark. In the open, this may mean a serious flash fire; confined, a destructive explosion. For safety: (1) Handle the liquid in enclosed piping systems and closed, vented containers. (2) Where vapors exist, provide adequate ventilation to prevent the formation of explosive mixtures. (3) Install explosion vents to relieve pressures and reduce structural damage. (4) Eliminate ignition sources. (5) Provide adequate special fire protective equipment.

Flammable gases are frequently used as fuels for ovens, dryers, furnaces, boilers, kilns, and similar equipment. To eliminate fire and explosion hazards, arrange fuel storage and distribution safely and prevent the accumulation of unburned gas-air mixtures within the units by proper ventilation and adequate safety controls. Where heavier-than-air gases such as propane or butane are used, special ventilation is needed for pits and low areas.

Flammable dusts offer considerable explosion hazard. The principle safeguard is to prevent dust accumulations by adequate collecting systems and excellent housekeeping. Elimination of ignition sources is especially important. Combustible fibers, other hazardous materials, and certain chemicals and chemical processes also offer problems calling for special attention.

The relationship between proper maintenance and general plant efficiency has long been recognized. Its importance in fire prevention is not always so well appreciated, yet at least one out of every five fires in industry can be traced to inadequate maintenance.

More factory fires start from electrical causes than from any other cause. Equipment is usually well designed and properly installed. The principal trouble is inadequate subsequent maintenance. The necessary type of maintenance and frequency of maintenance operations vary greatly with the equipment, location, and operating conditions.

At motors, keep windings, ventilating ducts, commutators, and brush rigging clean and lubricate regularly and carefully. Examine bearings, commutators, the air gap between rotor and stator and motor leads regularly. Overhaul motors annually or more frequently under severe conditions. Keep starting switches, compensators, and circuit breakers clean and in good condition. Check tripping points of circuit breakers monthly. Make sure that insulation of wiring throughout the plant is in good condition and that lock-nuts and bushings on conduit and armored cable are tight. Particularly check locations where vibration is severe. Make certain that circuits are not overfused. Make certain that transformer operating temperatures do not exceed 90 C. Keep oil in good condition and at proper level. Lightning arrester ground resistance should not be over 5 ohms.

Prevention of friction fires at machines is largely a matter of correct lubrication. Lack of oil, or use of the wrong oil results in hot bearings which cause fires. Using too much oil may be as bad as using too little. Over-oiling leads to oily deposits on machinery and oil-soaked floors—conditions which en-

(Continued on page 21)

Application of
Portland Cement Paint

This paint is marketed in a dry powder form to be mixed with water before applying. . . . A wide variety of colors is available. . . . Such ingredients as waterproofing agents, accelerators, colored mineral oxides and opacifying agents may be added. . . . They are not suitable for painting wood or metal

GENERAL instructions for the application of portland cement paint to exposed concrete masonry walls are given in the caption material for the illustrations on these pages. Some other Do's and Don'ts follow:

Efflorescence on the surface of the concrete masonry wall can be removed by first wetting the surface with water and then scrubbing with a 20 per cent solution of muriatic

Fig. 1. The portland cement base paint must be thoroughly mixed with water in accordance with the manufacturer's recommendations. A wide, shallow pan should be used for container

Fig. 2. The paint must be mixed thoroughly to the consistency of thick cream. Paints mixed with too much water produce thin paint films having little covering power, watertightness

Fig. 3. Crazing and checking of paint over the joints is minimized if the mortar is well cured. The surface of the wall to be painted must be uniformly dampened with water just prior to applying each coat of paint. If this is not done the surface will absorb too much of the mixing water from the paint and it will not harden properly

Fig. 4. Shown here are four common types of brushes used for the application of cement base paint. The brush used should have bristles not more than 2 in. long. Scrub brushes or fender brushes with stiff bristles of palmyra or Tampico fibers have been found to be satisfactory. Long-hair brushes are too flexible to force the paint into the pores

acid. This should be followed by a thorough rinsing with water to remove all traces of acid.

Small cracks or imperfections which may be present in the concrete masonry and which can not be filled by painting should be thoroughly cleaned of all loose particles, wetted and then filled with a thick paste made by mixing the dry cement paint powder and water.

This paint should not be applied to surfaces containing frost nor should it be applied when the temperature is below 40 F.

Painting exterior concrete masonry walls should be considered a weatherproofing as well as a decorative process. Concrete masonry units should be carefully laid. All joints should be well filled, shoved and tooled to compact the mortar. Too much emphasis can not be placed on the necessity of tight tooling of both vertical and horizontal joints.

The second or finish coat should not be applied until the seal coat has hardened sufficiently to prevent injury to the surface. This should not be sooner than 24 hr after the application of the seal coat. Whenever possible, the paint should be applied to shady sides of the structure. This permits slower drying of the coat. High winds, excess heat and strong sunshine will dry cement paint quickly and render it ineffective as a weatherproof coating unless precautions described here are taken to keep the surface damp until it is properly cured.

The photographs presented in this article were supplied through courtesy of the Portland Cement Assn.

Fig. 5. The brush must be kept well filled with paint and the first or seal coat should be scrubbed into the concrete masonry surface so as to fill all joints and poses completely with the paint. Before painting the masonry surfaces should be wire-brushed in order to remove dirt, dust and loose particles. All other foreign substances must also be removed

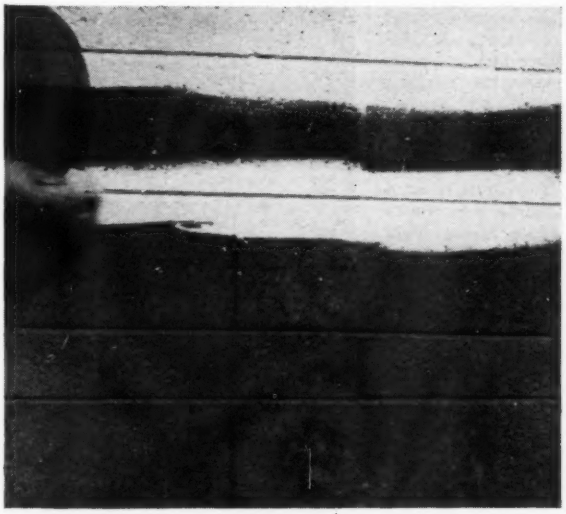


Fig 6. Mortar joints should be painted first to insure complete sealing of joints. Thorough scrubbing is necessary to force the paint into the open texture of the masonry. Merely spreading the paint over the surface will leave pin-holes through which moisture may penetrate into the walls. Whenever possible the paint should be applied to the shady side of the structure in order to prevent drying out

Fig. 7. This photograph shows the workman applying the base coat to the wall. When applying finish coat the painting work should be laid out so that an entire wall may be finished in one operation. If this is impracticable the painting should be carried to some natural stopping place. Keep the paint well stirred to maintain a uniform consistency

Fig. 8. The seal coat should be kept in a moist condition for at least 24 hr following its application. The finish coat should be kept moist for at least 48 hr. A garden hose equipped with a fog nozzle, as shown in the illustration, is an excellent means of keeping the paint moist. Properly applied and cured paint becomes an integral part of the concrete wall

The Know How of CAR LOADING

Loading a car with this company's product is a precision job . . . Some bags are damaged in transit but the percentage is surprisingly low . . . Given credit for this fact are the preparations followed in readying the car and the unique methods of bag-stacking in the car

By H. R. BEEN *Dowflake Plant Superintendent*
The Dow Chemical Co.

Fig. 1. Here is a workman loading a 30-ton car with bags. Note that the bags at the right rear lean away from the car wall

THE RAILROAD siding adjacent to Dow's factory is filled daily with cars being loaded with Dowflake. Sometimes the cars turn out to be cattle cars—and some of them are battered veterans of many years and hundreds of thousands of miles of rough travelling behind them; they have rough floorings, the sides are full of holes and much of the interior protective lining is missing.

The railroads have been as overtaxed as the Dowflake production plant since the war. Besides a staggering depreciation of rolling stock the roads have been forced to greater haste and consequent rough handling in transit. All these factors add up to a greater need for careful loading at the factory.

Loading today is done entirely by Manniere carloaders. But even with mechanical loading, piling bags in a forty- or fifty-ton load that won't shift in transit calls for scientific and supervised loading. The men who load cars are well trained and follow a definite plan under experienced supervision.

The cars are loaded with the "key-bag" system, and the system was described originally in Dowflakes magazine. This plan, developed over the years at Dow, is designed to prevent a minimum of shifting in transit. The load is balanced and has a tendency to settle centrally rather than towards the outside of the car. This is accomplished by building from a "key-bag," an extra row of bags along the walls of the car. (See Fig. 3.)

A forty-ton car contains 14 full tiers of bags piled in rows lengthwise with the car, plus one narrow tier which is necessary to consume all the space. This is called the "cub" tier and is placed two rows from either end.

Bags in the door area are recessed several inches to permit easy opening of the doors and to prevent the tearing of bags when the doors are opened. Under normal handling of railroad cars the clearance will still exist when the shipment arrives at its destination since the load tends to settle centrally. Only extremely rough handling will cause the load to shift against the doors.

Today cars are inspected with meticulous care. They are cleaned and the floors, when advisable, are covered with corrugated paper. Nails and any protruding objects are removed; holes in the floor or wall are patched and padded. The doors of cars headed for the West Coast or other distant points are completely lined with decking board.

Paper shortages make this general practice impossible today except on long haul cars. But the door sills are padded on all cars. If a car is in such bad condition that loading supervisors feel the risk of damage is too high, when shipping a maximum load, a smaller load is made. The final task of the workmen preparing the car is the posting of a loading diagram on the wall of the car.

Today a forty-ton car has 40 t of Dowflake loaded with little chance for error. In the first place, bagging equipment operates on a net weight basis for each individual bag. As a second step, to assure weight accuracy, bags are counted in and are re-counted by an inspector before the car is closed. Finally, the car itself is weighed, before and after loading, on regularly inspected railroad scales.

We know that all the theory in the world about scientific carloading won't appease the customer who receives a car containing damaged bags. When he receives such a shipment, of course, he should file his claim with the railroad company. (But we want to hear about it, too.)

Sometimes the location of the breaks on the walls of the bag are a good clue

Fig. 2. Loading diagram being posted in the car by one of the plant men

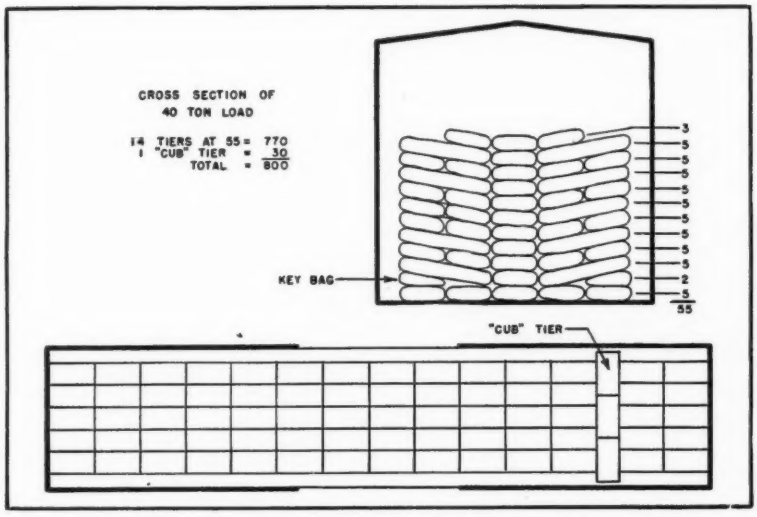


Fig. 3. Typical plan and end elevation of a railroad box car containing 40 t. Note how the key bag tilts the side tiers of bags away from the wall of the car.

to where some possible fault lies. Dow doesn't knowingly ship a defective bag. If a bag breaks or is torn during loading it is removed and any spilled flake is immediately swept out of the car. Rough handling by the railroad is most likely to cause tears in the ends and sides of bags. Probably the most damaging practice is the occasional "humping" of a car on a siding. When and if this is done it is doubtful if any load will stand up completely.

To Eliminate Fires

(Continued from page 17)

able fire to start readily and spread rapidly. Any plant with a scientific lubrication program will spend less for maintenance and repairs, use less power and less oil, get increased production from its machinery and will be a cleaner and safer place to work. It will also have fewer fires.

Management of a modern plant today recognizes the importance of preventing fires and maintaining adequate protection against fires not prevented. In modern successful plants interest in fire prevention pervades the entire organization from management down through the supervisory personnel to the employees themselves. The responsibility for planning and coordinating fire prevention and protection must be definitely assigned to one or several individuals as the plant size and organization may require. The men given this responsibility must make the foremen realize that fire prevention is a part of their job of maintaining production without interruption. It will be necessary to secure the cooperation of employees, teach them to recognize fire hazards and establish definite regulations as needed.

Electro-fluid Drive on Punch Press

By R. O. FRISTOE, *Plant Engineer, Ewart Plant, Link-Belt Co.*

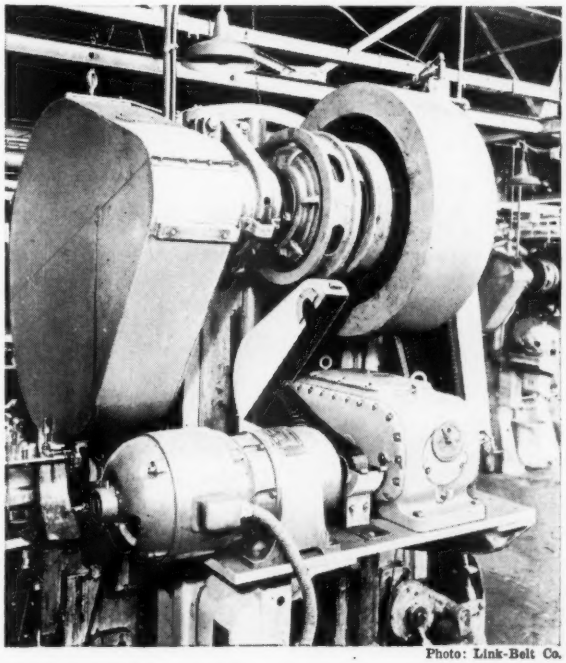
THE EWART Plant of Link-Belt Co., in Indianapolis, has been using three Bliss punch presses for blanking out chain links and two additional presses are to be installed shortly. The blanks which are punched on these machines are both thick and thin and this necessitated an arrangement whereby the speed of the presses could quickly be changed to permit fast punching of the thin pieces and slower punching of thick stock.

Variable speed transmission applied to these presses gives them a speed range of 60 to 90 strokes per minute and the various speeds can be attained simply by turning a handwheel on the P.I.V. gear unit. More recently we applied an electrofluid drive to one of the presses.

Originally, the manufacturer of the presses had recommended, and we had installed, a 15 hp motor with an across-the-line starter, which drove the machine satisfactorily. Tests had shown a demand for full motor capacity to start the press but only 5 hp to 7½ hp normal running load after full speed had been attained.

The 10 hp electrofluid drive starts this heavily fly-wheel press smoothly and without difficulty and recent tests show that we can drive the press with 7½ hp. We are now installing two additional presses with these drives.

The complete press drive included, in addition to the electrofluid unit, a silent chain drive to the P.I.V. gear and another silent chain drive to the flywheel. The flywheel drives the press through an air clutch. The P.I.V. gear permits setting the speed of the press for the most economical production consistent with good tool life and the characteristics of the pieces blanked.



Shown here is a Bliss punch press equipped with an electrofluid drive for smooth starting

Photo: Link-Belt Co.

Solution Cleaning of Floors and Walls

By R. L. FISKE, *Editor,*
Oakite Products, Inc.

COLOR PAINTING and the advantages to be derived from its use are increasingly gaining the attention of industry. In brief, the color program provides for painting of ceilings, walls, and floors, in light, restful shades which offer not only high reflection values but also sustain worker energy through lessened eye fatigue.

Selection of the most effective color varies, of course, according to individual plant conditions so color specialists are available to make a careful detailed examination of the requirements and conditions of each paintable surface and from the collected data, make specific recommendations covering the entire plant.

The importance of proper and thorough cleaning prior to painting cannot be emphasized too strongly. A paint coat is only as good as its bond and without proper cleaning the bond is sure to be unsatisfactory. When painting or cleaning is mentioned the mind turns first to floor, walls, and ceilings.

So far as the washing of ceilings and walls is concerned, as anyone who has ever painted his own kitchen can testify, the cleaning job consumes at least as much time and effort as the painting itself and when it comes to painting an industrial plant having many thousand square feet of wall, ceiling and floor space, it can readily be seen that selection of the most efficient time-saving methods is most important, if costs are to be kept within reasonable limits.

For washing walls and ceilings use a detergent that has the ability to rapidly remove greasy dirt and dust deposits and which will rinse freely. The sponge and pail method is probably best for small plants but for large factories purchase or rental of a modern wall washing machine is recommended. The machines do a thorough job in a fraction of the time that would be required by hand methods.

The choice of method and material will vary depending on whether the walls are wood, concrete or plaster. In general, washing the room itself rarely presents a technical problem and the paint contractor generally has the equipment and the know-how to do a good job.

Cleaning of floors for painting often presents a more difficult problem. In some cases the floors may have been entirely neglected for years as in machine and repair shops for example. In these cases ground-in, hardened, grease and dirt deposits up to an inch or more in thickness have to be removed.

The recommended procedure is to wet the floor down thoroughly and then sprinkle with a dry material. This is allowed to soak in overnight, the concentrated solution penetrating the deposits so they can be loosened by scraping. The procedure may have to be repeated on heavily coated floors. After the gross deposits are removed, the floor is scrubbed with a stiff fiber brush employing a strong solution of the same material. By following this procedure the concrete can be cleaned to practically its original white appearance.

More or less regularly maintained floors do not present such a difficult cleaning problem. Simple scrubbing or mopping with an efficient alkaline detergent will effect the thorough cleaning needed for proper paint adhesion. If the floor is already painted it may have peeled in areas of greatest traffic and it might be desirable to remove all the old paint. In this case a specialized water-soluble paint remover should be employed in much the same manner as described for the grease and dirt encrusted floors above. This material is as efficient, or more so, than the dangerous, inflammable acetone paint removers, and is also much more economical.

Steam-detergent cleaning and steam stripping of paint are effective methods for floors and these will be described later on in this article. It should be noted that all concrete floors cleaned down to the bare concrete should be etched or neutralized with a dilute acidic solution to insure proper paint adhesion.

The steam detergent cleaning method affords the means of reaching every portion of the surface, bringing to it a powerful cleaning action that will remove the most tenacious deposits. In plants having a central steam supply of 40 lb or more pressure steam detergent cleaning can be secured with a very low investment in equipment. All that is needed is a gun and suitable lengths of steam and solution hose.

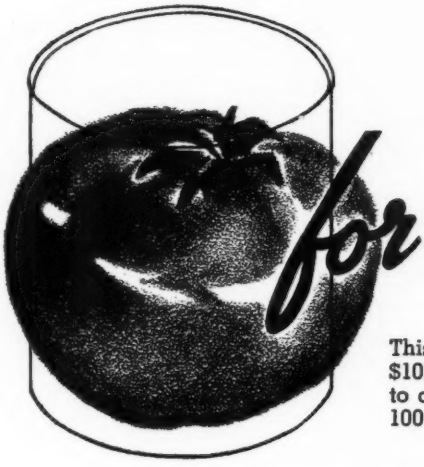
The gun recommended is of the solution lifting type. It utilizes the force of the steam to lift the cleaning solution from the container and combines it with the steam in the nozzle of the gun, thus providing a triple combination of heat, mechanical force and detergent action. The gun is equipped with steam and solution valves so that fingertip control of steam and solution is available. The cleaning solution is prepared in an ordinary steel drum and is heated to boiling temperature simply by immersing the head of the gun therein. To start steam cleaning, the operator opens the steam and solution valves and the solution is lifted from the container automatically. No pumps or gravity feed arrangements are necessary.

All the foregoing would not mean much without emphasizing the importance of proper maintenance after the completion of the painting program. When the painters leave, the finished plant will be easy on the eyes and nerves. Pleasant, harmonious greens and yellows will meet the workers' eyes and the entire plant will have a cheerful, nice-to-work-in atmosphere. But in the average industrial plant that picture would change greatly in a few months, if the proper maintenance were not carried out. The lighter wall paints

(Continued on page 24)

Fig. 1. Cleaning walls in a cold storage room. A portable steam cleaning unit is used for this

Fig. 2. With the floor thoroughly wet down the dry powder is sprinkled on. A brush works the solution into crevices



PROCESS HEAT for Better Canned Tomatoes

This small packing plant increased the value of its production by $10,000 because it was able to cut time required to bring its product to a boil from 7 minutes to 3 minutes . . . In addition, approximately 100 gal of oil were saved per operating day . . . Packaged boiler units

By ARTHUR A. CONTE, *Conte & Sons Packing Co.*

CONTE & SONS packs tomatoes exclusively. These tomato specialties range from canned whole tomatoes to delicate Italian sauces. Supplies of whole ripe tomatoes are more than adequate in the surrounding Bucks County farming community. No tomatoes are actually grown by this company. Our principal product is a pack of skinless mashed tomatoes which is sold for home use in making homemade meat sauces and other appropriate seasonings.

Four 700 gal evaporating kettles cook the pulp and here it is concentrated to about half its original volume. These kettles are heated by steam through concentric rings of coils in the bottom of each concentrating tank. After cooking, the concentrated puree flows to the canning machinery.

Partly to speed up production and partly to insure rapid cooking and thus preserve the bright red color of the puree, a Cochrane high-pressure condensate removal system was installed on the four concentrating kettles. Steam is generated in two 80-hp Ames "package unit" boilers at 115-120 psi. Each of the tomato concentrating kettles is individually trapped with a bucket trap which is bypassed with a needle valve. By use of the high pressure return system, a high back pressure is maintained on the cooking coils. Instead of periodic dumping of condensate into an atmospheric receiver, condensate is removed continuously as it is formed at high pressure. Thus, instead of occasional flooding of the coils and periodic reductions of pressure to something approaching atmospheric pressure (212 F) as the traps open, a uniform back pressure of 100 psi (331 F) is maintained on the cookers and faster and more uniform cooking results. Scorching is effectively prevented.

With the condensate return system, condensate and insulating entrained air are removed from the cooking coils by the positive suction pressure of the pump unit. The air is eliminated from the unit by passing through the separator; the condensate is returned direct to the boiler continuously at a temperature of from 320 F to 330 F and at a pressure of about 125 psi. Thus the circuit from the boiler through the cooking coils and back to the boiler is completed in a closed circuit at maximum pressure and temperature. The turbulent steam flow induced in the coils by the continuous removal of condensate results in the higher and more uniform cooking temperatures.

As the tomato pulp covers the cooking coils in the bottom of the kettles, steam is admitted to the coils. The 700-gal kettles continue filling to capacity and break into a rolling boil in about 3 minutes. Since this is an appreciable reduction from the 6 or 7 minutes required with open-system drainage to a vented receiver, the improvement in the cooked product due to faster boiling is quite noticeable.

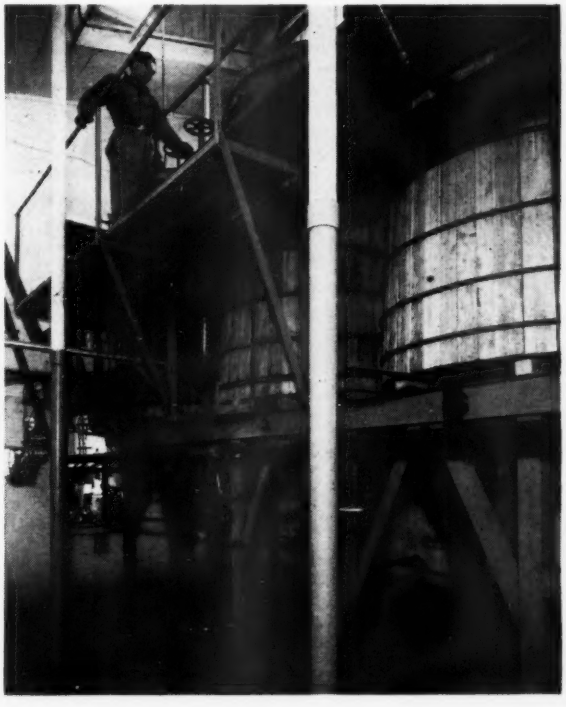
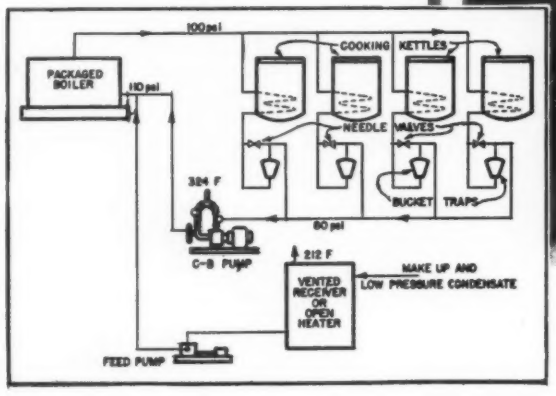


Fig. 1. Shown in this photograph are three of the four 700 gal coil cookers at Conte & Sons Packing Co., Perkasie, Pa. Stainless steel is used for piping the food products at this plant

Fig. 2. This is the heat balance diagram for the Conte plant



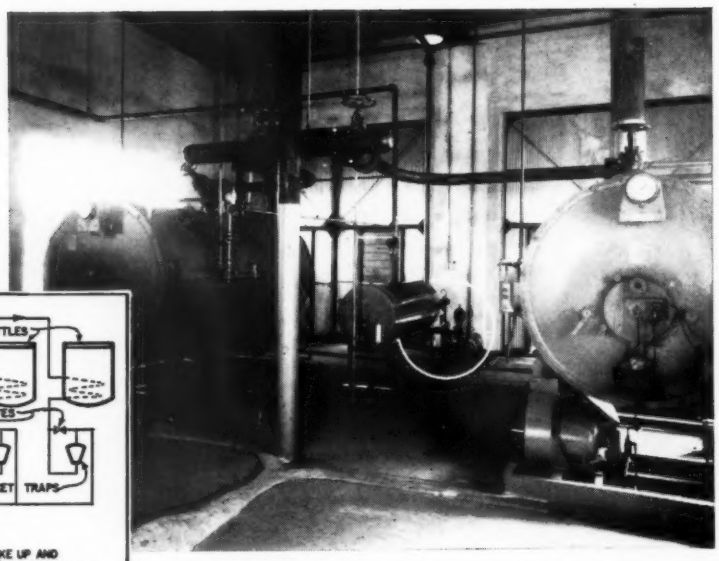


Fig. 3. The packing company has two Ames packaged steam generators and a Cochrane C-B high pressure condensate return system. Steam is furnished at 100 psi by the boilers to the cookers and the condensate is returned to the boilers by the C-B system

Total cooking time has been reduced by 30 per cent to 40 per cent making possible increased production of tomato products valued at something close to $10,000!

The condensate removal system is a specially designed centrifugal pump which draws water from the thermo-fin priming loop and discharges it as a high velocity jet through the jet pump nozzle. This jet strikes the returning hot condensate and induces condensate flow through the venturi-shaped mixing tube and into the thermo-fin priming loop. The additional volume of condensate introduced into the constantly-filled loop results in the discharge of an equal volume through the air separator.

Most pumps cannot handle the hot condensate due to steam binding from flashed steam because of the reduced pressure at the suction inlet. When cooking load is falling, such as just before shutdown, the thermo-fin loop maintains a small temperature depression to insure that condensate is cooled sufficiently, in addition to the small radiation loss in the condensate line from the cooking coils to the unit, so that pump operation is maintained whether condensate is actually flowing or not. In starting up additional equipment, faster heating is accomplished by positive turbulent steam flow.

In addition to the production advantages of high pressure condensate return, there are definite fuel savings due to the return of condensate at 110 to 120 F higher temperature than that which would be maintained in a vented receiver. At a maximum load of 600 gph, or 5000 lb per hr, this could result in a saving of nearly a million Btu per hour or something like a hundred gallons of oil per 18 hour day.

Fig. 4. Here the cans of tomato puree are labeled and packed thus completing the processing

Solution Cleaning

(Continued from page 22)

would be several shades darker and the production machinery with its contrasting shades would have assumed its previous drab appearance. Obviously, washing of all painted surfaces on a regular schedule is a necessity.

In the average plant, walls and ceilings would probably have to be washed only once or twice yearly, although in some industries where oil mists and dust are projected into the atmosphere, more frequent washing would be needed.

It is suggested that before embarking on a full color program the plant consult the local technical service representative of a reputable cleaning material manufacturer. These representatives have had wide experience in cleaning problems and can make valuable suggestions and recommendations for overall handling of the work which will greatly help to insure the success of the project. This service, combined with the service of the paint manufacturer's representative, will provide the technical know-how and experience so necessary to the satisfactory completion of an important project of this kind.

Radiant Heated Road Is Free From Snow

TO ELIMINATE the hazard and delay that could be caused by winter's snow and ice on a 600-ft long, two-lane roadway leading into the Bridgeville, Pa., plant of American Cyanamid Co., engineers of that firm designed a snow-removal system consisting of hot water pipes embedded in the concrete pavement.

The road, 24 ft wide, is on a constant up-grade from the plant to a main thoroughfare. Snow and ice would make it virtually impassable, creating a severe traffic problem especially during shift changes.

The snow-melting road is constructed of an 8-in. concrete slab, resting on graded earth. Embedded in the concrete at the bottom of the slab, are eight lengths of black wrought iron pipe, positioned on the road bed in such a manner as to provide two pipes 18 in. apart beneath each wheel track in both lanes.

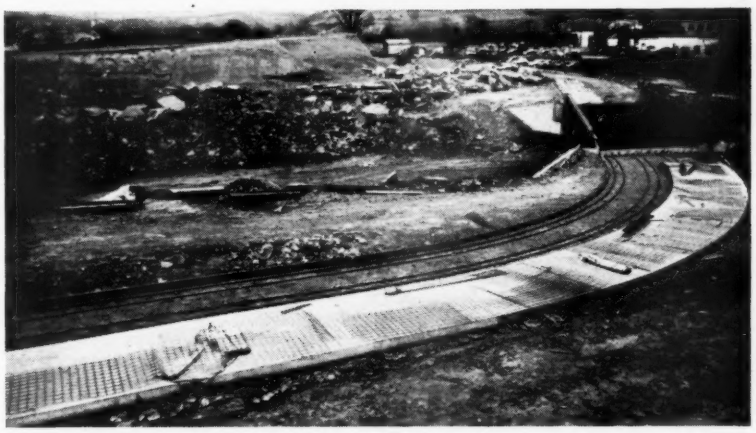
These pipes run the entire 600 ft from the main thoroughfare to a small bridge near the employees' parking lot. The pipes are welded at each end of the turn to wrought iron header pipes 4-in. in diameter.

Hot water, at an average temperature of 180 F is circulated through these pipes approximately 50 gpm against a head of 17 ft. The water is heated by steam from the plant's boilers in a convertor used especially for the snow melting system. Sufficient anti-freeze solution is added to the system to prevent freezing during periods of non-operation.

Under maximum operating conditions, the system is expected to accomplish the removal of a minimum of 1 in. of snow or 1/10 in. of ice per hour. Engineers have calculated that snow-falls in excess of this rate are unusual and it is not considered practical to design such melting system for greater capacity.

An insurance against air lock in the system, two air vents are tapped into the piping layout at the highest point and provisions for drainage were installed at a low point.

The pipe runs, based upon engineering experience, are estimated to provide snow-free, ice-free wheel tracks about 2 to 3 ft in width. Heat, transferred from the buried wrought iron pipes to the concrete, will warm the pavement sufficiently to melt snow and prevent ice from forming. Residual water will be quickly evaporated from the warm surface by natural air currents.



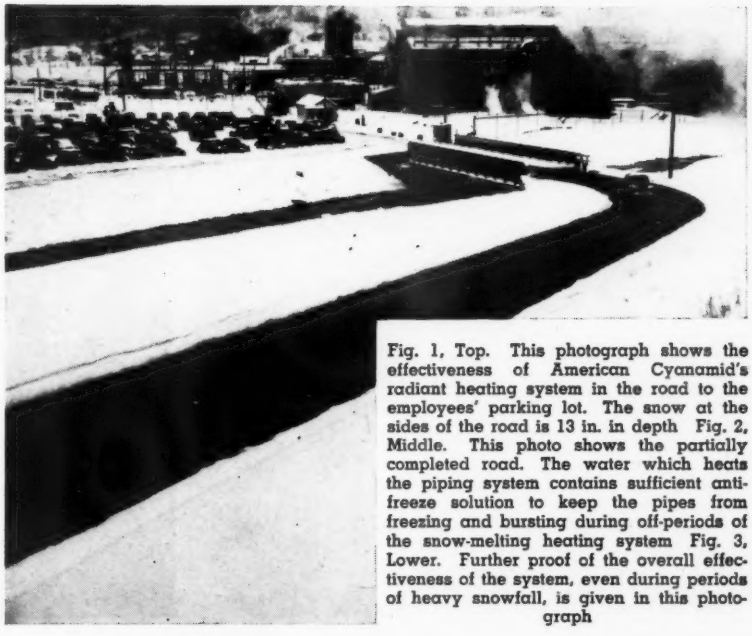


Fig. 1, Top. This photograph shows the effectiveness of American Cyanamid's radiant heating system in the road to the employees' parking lot. The snow at the sides of the road is 13 in. in depth Fig. 2, Middle. This photo shows the partially completed road. The water which heats the piping system contains sufficient anti-freeze solution to keep the pipes from freezing and bursting during off-periods of the snow-melting heating system Fig. 3, Lower. Further proof of the overall effectiveness of the system, even during periods of heavy snowfall, is given in this photograph

Metal Finishing Practice at Willow Run

Investigation and use of proprietary cleaners . . . Equipment used on priming and painting . . . Precise control of air in spray booth . . . Description of Peters-Dalton plenum chamber . . . Paint mixing equipment and operation . . . Piping color scheme

By D. D. HERRMAN, *Chief Engineer, Hartzell Propeller Fan Co.*

PRODUCTION lines at Kaiser-Frazer's huge Willow Run plant were set up for manufacture with finishing operations performed at those stages of fabrication where they logically belong. These finishing operations include mechanical finishing, cleaning, Bonderizing and painting.

It was felt that proprietary cleaners were of very definite value and that they must be considered in the overall question of possible sources for cleaning compounds. Consequently, specifications were set up to cover proprietary cleaners and a large group of them are tested simultaneously. These tests are followed by production trials, with the result that those passing laboratory and production tests with the highest scores are listed as optional approved sources.

As a rule, synthetic organic types of emulsion cleaners are used, either alone or in combination with alkali. They may consist of aqueous emulsions of synthetic chemicals with or without petroleum products, which when used properly, (preferably with a power washer) remove both grease and solids. Tack ragging is not necessary with these cleaners. When used in a single-stage washer or when the cleaner is added in proper concentration to the rinse water, a thin residual film is deposited on the surface of the part, which effectually prevents subsequent oxidation and corrosion.

According to John T. Ott, the Kaiser-Frazer chief chemist at Willow Run, a good cleaner should exhibit three fundamental properties. First, it should reduce the surface tension of the solution so that the detergent film can get under the dirt. Water has a surface tension of 72 dynes per centimeter. This should be reduced by the cleaner to about 35 to 40 dynes per centimeter. Second, a cleaner should admit the possibility of separation of grease from the used solution. This property, contingent also upon proper design of the washing machine, is usually facilitated in practice by having a grease solution trough located near the top of the machine along one side; solid matter falls to the bottom of that side and is prevented from entering the other side, where the solution escapes via the pump, by a screen of proper mesh. Third, a cleaner should remove smut. Smut may be a stain of solid atmospheric dirt, it may have been rubbed on the part or it may consist mostly of abrasive material left on the part after polishing. As pointed out by Mr. Ott, until recently it was the practice of metal finishers to use an alkali in order to remove the grease by saponifying it. This is no longer necessary since the advent of emulsion cleaners.

In the first operation at Willow Run the car body is stamped and welded. It is then completely mechanically finished by buffing. The body is then ready to be Bonderized. Bonderizing is done in two mammoth 5-stage installations, one installation handling Kaiser cars and the other, Frazer automobiles.

Each of the five stages of these two units consists of a four-way spray system. Specifications for the stages are: 1—Parco cleaner with Orthosil at 150 F; 2—Water rinse at 140 F; 3—Parker spray Bonderite 100 at 135 F; 4—Water rinse at 150 F; 5—Parcolene chromic-phosphoric acid solution at 160 F.

Bonderizing is followed by a blow-off operation and this by passage through a short gas-fired oven at 150 F. After transit through this oven, and sufficient cooling, the underbody spray is applied in a water-washed type of spray booth, the operators being fully protected. The body is then ready to be glazed. In glazing, solder joints are knife filled with putty by hand.

Bodies are next transferred from body building trucks to body paint trucks. They are then conveyed to the primer line. Passage takes 35 minutes. Here again there is one line for each make of car, and each of these lines is capable of turning out 45 bodies per hour.

After emerging from the baking ovens, bodies are allowed to cool. A body deadener is sprayed on floor pans, under cowls and trunk lids and on doors and an air and dust sealer is sprayed on all welded seams. Body paint trucks are now transferred from the two primer lines to a paint line arranged to accommodate the same trucks.

Since it is known that precise control of air in spray booths is vital to complete success, different types and makes of fans and blowers were tested —first in the laboratory, then under actual working conditions. It was essential, Kaiser-Frazer engineers felt, that the air-moving equipment be quiet; that it operate against the rather high pressures involved with low power consumption per foot; that it be easily installed; that it occupy a minimum of space; that it operate without attention or repair over a long period of time; and that its air delivery be very accurately controllable. Vaneaxial blowers, made by Hartzell Propeller Fan Co., were selected after these tests.

The first operation on the paint line is a water sanding operation in which mechanical air sanders are used in conjunction with water to bring the entire body surface down to as smooth a finish as possible. This is followed by an auto-

Fig. 1. This is an end view showing one of the underbody spray booths. Note the location of the exhaust stacks

matic cold water spray to remove sludge. After passage through a small drying oven, a varnish tack rag operation is performed. In it, a specially-prepared straining cloth, soaked in varnish and then dried is used by hand to remove all particles of lint, dust, etc. Bodies then enter the first plenum chamber.

This plenum chamber, largest ever installed for such a purpose, includes four parallel production lines. It is actually a large room containing criss-cross type water-washed spray booths, plus space for an appropriate flow time interval. Although the chamber is not sealed, a temperature of 75-80 F is maintained by the introduction of 180,000 cu ft of warm, filtered fresh air per minute. It is so designed that only 160,000 cu ft of air can escape from it per minute until slight static air pressure has been built up. This makes it impossible for air to enter the chamber except through the main supply. This delicate pressure balance is maintained by Vaneaxial blowers. Since the air supply is filtered, no dust can enter the chamber. In this chamber, a sealer coat is sprayed on the bodies. The same sealer is used on all bodies, irrespective of color. It produces and helps to maintain a luster as a base for subsequent color coats.

From the first plenum chamber, bodies are conveyed through gas-fired drying ovens at 275 F for 35 minutes. After cooling, they undergo a sanding or "scuff" operation, which consists of a very careful hand sanding for the purpose of removing any high spots. This operation must be performed very skillfully. It calls for the exercise of a high degree of artisanship on the part of the operator. Hand sanding is followed by a cold-water rinse to remove sludge, and this is followed by passage through a short drying oven. A second varnish tack ragging operation is now performed and the bodies are ready for the color booths.

All paint for the entire Kaiser-Frazer Willow Run plant is mixed in one centrally located paint mixing department. In all, twelve different colors are involved, plus one for the underbody and one for the primer surfacer combination. Two parallel rows of 120-gal paint mixing tanks are used, with 14 tanks in each row. Each tank in one row is located opposite a tank in the opposite row which is used for the same paint. Piping is arranged so that either one of a pair of tanks can be used for mixing while its twin is being used for pumping.

While paint is being mixed in one tank, paint from the opposite tank is being pumped through pipes to every spray gun in the Willow Run plant where that paint is to be used. Non-sparking aluminum paddles are employed in the mixing tanks, arranged in double sets of two-bladed paddles. All electrical equipment associated with the paint mixing department is fully enclosed, and only explosion-resistant motors are used. All colors are coded by number, the fourteen exit pipes and 14 return pipes being painted green.

Color booths are of the Peters-Dalton down-draft tunnel type, with excess spray being sucked down through floor vents. The operators are staggered in position. All twelve colors are available in each booth, plus a single air line at 100 psi pressure, equipped with a water or oil extractor. One gun is kept permanently hosed to each color line, snap-off connections being available to the air line. Color coats are followed by suitable flow time space, this space and the color booths making up the interior of the second plenum chamber.

Coloring is followed by a 35-minute passage through a drying oven at 275 F. Taping operations are now performed in order to mask off parts for any specified two-tone coloring, which follows immediately on those bodies designated for two-toning. In the two-tone booth uppers are sprayed on bodies previously colored only on lower parts. This is followed by two-tone drying for the uppers, and this by paint inspection. After inspection, bodies are transferred to the trim line, where trim is installed. Automobile wheels are sprayed in an automatic machine equipped to spray from 800 to 900 wheels per hour. Chassis are sprayed in a criss-cross water-washed spray booth, and dried in an A-type steam-heated oven held at 180 F. These facilities will handle about 45 chassis per hour.

Fenders, hoods, stone deflectors and radiator grills are processed on their own paint lines, which incorporate essentially the same details as in the case of the body paint lines.

All finishing operations at Willow Run are directly or indirectly subject to rigid control by the laboratory. Plans for a new laboratory include 15,000 sq ft of floor space on the first floor and 9,000 on the second. The laboratory will be subdivided into departments or units, those on the first floor including departments for physical testing and stress analysis, heat treat research, miscellaneous testing, experimental electroplating, X-ray analysis, instrumentation and sample preparation, stock storage and service. Units on the second floor will include spectograph, chemical control and research, lubrication control and research, rubber and plastics control and research, corrosion investigation and laboratory offices.

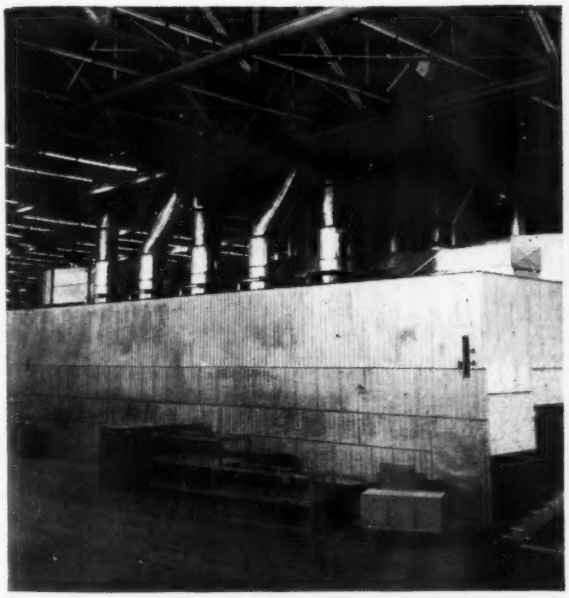


Fig. 2. This is a side view of one of the two plenum chambers. The author points out that these plenum chambers are two of the largest ever installed for this purpose

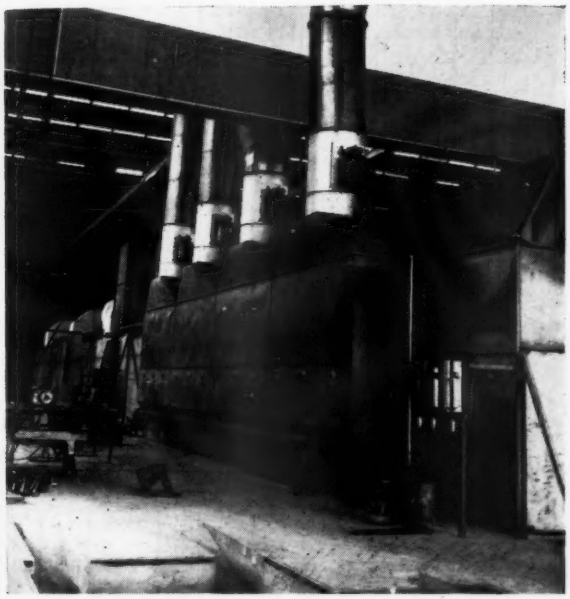


Fig. 3. This picture shows the exterior of the repair booth at the end of the paint line. Note particularly the compact arrangement of washer sections and exhaust stacks

The How and Why of Steam Trapping

Part V. Installation and maintenance of traps . . . Strainers, valves and piping . . . Location of traps . . . Use of check valves to stop siphoning and reduce water hammer . . . Bypasses——when and when not necessary . . . Determination of proper discharge pipe size . . . Sizing discharge pipe and headers to avoid choking up and high back pressure . . . Check list of trap troubles . . . What to do if a trap does not drain properly

By H. G. EBERT, *Yarnall-Waring Co., Philadelphia, Pa.*

TYPICAL INSTALLATIONS of steam traps are shown by Figs. 19 to 26 inclusive. Note that strainers are located ahead of the trap in each case. Installation of a fine screen strainer just ahead of every steam trap is excellent practice and may reduce maintenance of the trap to an extent which will save the cost of the strainer many times.

Although the steam fed to an apparatus may be as clean as it is possible to generate it, some corrosion is bound to take place in the piping and the products of corrosion will eventually find their way to the trap unless intercepted by a strainer or another form of dirt catcher.

It is practically impossible to keep dirt, grit and scale out of pipe lines and this too will be stopped by a suitable strainer. Accumulated dirt, scale and other foreign matter will eventually affect the operation of any trap, regardless of type. The strainer should be of a type which may be cleaned easily and this cleaning should be a routine matter, taken care of at frequent and regular intervals.

When possible, the trap should be located below the apparatus to be drained, the gravity drainage so provided helping in the rapid removal of condensate and air. When it is necessary to have a riser in the discharge line from a trap, a check valve should be installed at the lowest point in the piping.

This applies also where it is necessary to locate a trap above the apparatus. The check valve will prevent the condensate which has passed out of the apparatus from syphoning back into it and will eliminate or reduce water hammer caused by flashing condensate entering the vertical leg and mixing with the cooler water in it.

By-passes around steam traps are generally desirable to permit maintenance of traps without shutting down the apparatus. They are not always necessary where a trap is conveniently located and is of such a design that cleaning or replacement of internal parts is a matter of minutes. Where such well designed traps are used, keeping a spare set of replacement parts on hand is good economy.

If the trap gives trouble, the working parts may be quickly replaced and the cause (probably dirt or corrosion) may be corrected at a more convenient time and without interruption of service. In such cases, where bypasses are not used a shut-off valve must be placed ahead of the trap and strainer.

In making a steam trap installation it is desirable to use liberally sized piping for both the inlet and discharge lines of the trap. It is often advantageous to make the pipes somewhat larger than the actual size of the trap connections. This will more frequently be necessary on the discharge side of a trap since here the flash steam as well as the condensate must be adequately handled. When the trap is working in the higher pressure ranges a considerable amount of flash steam will be formed in the discharge line. Unless this large volume of steam is carried in an adequate discharge line it will choke up the discharge and create a high back pressure with con-

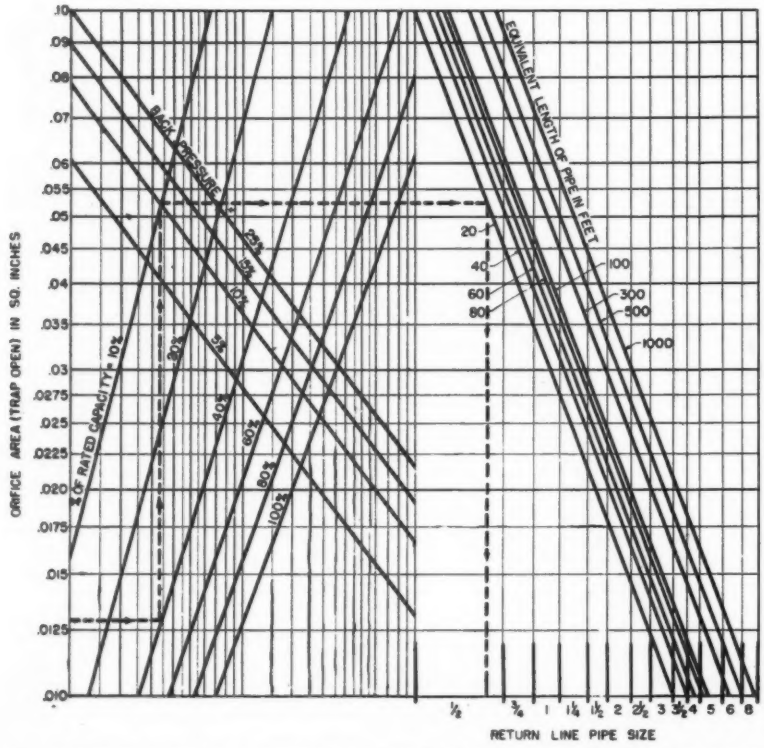


Fig. 18. Chart designed to simplify the determination of correct discharge pipe size for steam traps discharge line

sequent reduction in trap capacity and effectiveness.

Figure 18 has been prepared to simplify the determination of correct discharge pipe sizes. For example, let us assume a ½ in. trap with a net orifice area of 0.013 sq in is to be installed. The back pressure is expected to be about 10 per cent of the inlet pressure (this could be the pressure carried in the exhaust header, condensate receiver, etc.), the trap has been sized on a safety factor of 2.5 resulting in a capacity factor of 100 divided by 2.5 or 40 per cent and the discharge pipe will have an equivalent length (including allowance for fittings) of 20 ft.

The latter figure will include the length of the discharge piping from the trap to the receiver, header, etc.

Using Fig. 18, enter from the left at the orifice area of 0.013 sq in, proceed horizontally to the 40 per cent capacity factor line, then vertically to the 10 per cent back pressure line, again horizontally to the 20 ft equivalent pipe length line and then drop vertically to bottom of the chart, reading the correct size of the discharge line as ½ in. Note that if the equivalent pipe length had been 60 ft a ¾ in discharge would have been required.

The chart may be used for determining discharge header size for a system of traps by entering it with the total orifice area of the several traps. When a header of graduated pipe sizes is to be worked out it will be found desirable to start the determination from the discharge or large end and to enter the chart with a new and reduced orifice area as each successive trap discharge is passed in working up-stream.

Good traps receiving reasonable maintenance will give long and efficient service under normal operating conditions but it might be well, nevertheless, to conclude by listing some steps to be taken in solving trap difficulties. Aside from mechanical failure or breakage there are basically only two kinds of steam trap troubles, either a trap will not drain out the condensate or it blows live steam. The remedy or proper action in either case is indicated in the accompanying table.

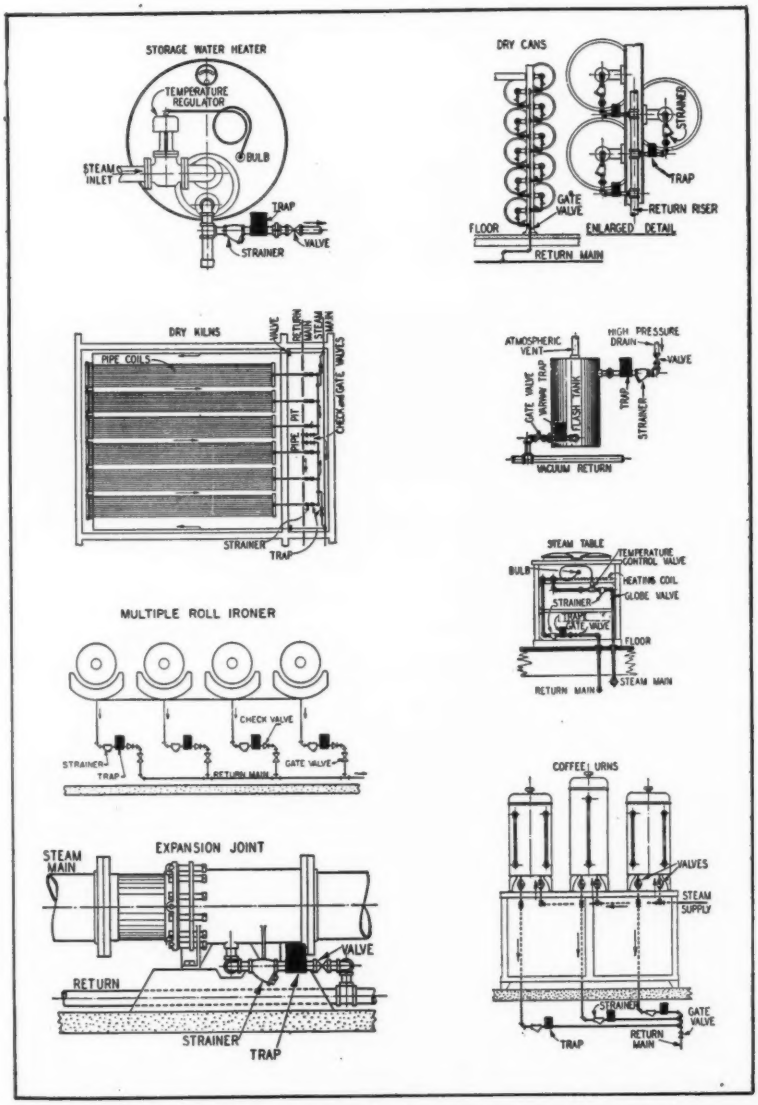
Check list of items to check when traps do not operate properly

If the trap does not drain properly:

1. Check size of trap. It is preferable to have a trap a little too large rather than too small.
2. Check actual steam pressure at trap inlet, (not boiler pressure nor pressure at inlet of apparatus being drained).
3. Is piping to or from trap clogged with dirt? A strainer should be used ahead of all traps.
4. Are there broken valves, parts of discs, or pieces of packing, etc. in pipe line? This does happen.
5. Are traps being short circuited by the use of one trap on several pieces of apparatus? Remedy: Install a trap on each piece of apparatus.
6. Are strainer perforations sufficiently fine? A strainer which is too coarse is no better than none at all.
7. Is strainer full of dirt? Strainers need cleaning out regularly.
8. Do not expect to get a high temperature on the apparatus when the steam line temperature is not high enough. This has happened.
9. See that non-return traps are not installed so that they must return condensate direct to a boiler.
10. Is the trap installed backwards? Look at the arrow on the trap body.
11. Has adjustment or mechanism been tampered with or damaged?
12. Is back pressure too high for proper drainage?

If the trap blows steam:

13. It is easy to determine whether the trap is really blowing steam or if the discharged vapor is only flash steam from a small amount of hot condensate. If blowing live steam, the discharge will show a heavy (and loud) blast of clear looking steam. If it is only flash steam from condensate, the discharge on light loads will show like a white cloud of vapor flowing out easily with very little "kick" to it and in most cases a little condensate. This operation is correct and cannot be improved upon.
14. If it is decided that the trap is blowing live steam check it for dirt fouling, mechanical failure or wear and tear.



Figs. 19 to 26. Additional installations showing typical trap application and arrangement on (first column, top to bottom); Fig. 19. Storage water heating; Fig. 20. Pipe coils on dry kiln; Fig. 21. Multiple roll ironers; Fig. 22. Steam main expansion joint; (second column, top to bottom) Fig. 23. Dry cans; Fig. 24. Flash tank; Fig. 25. Steam table; and Fig. 26. Coffee urns

Editor's Note: This is the concluding installment of a series of five articles which started in the March 1948 issue of PLANT ENGINEERING.

The Role of Arc Welding in Remodeling Machinery

By ROBERT J. JACOBS and HOWARD SECHREST

THIS IS A case history of one of the most unique welding jobs ever undertaken by the authors during their 26 years of experience. About a year ago we were called in by the Madison Kipp Corp., a die casting concern located in Madison, Wis. Madison Kipp wished to modify a number of their 160-t progressive die casting presses. In the main, these presses consisted of two large steel castings, each forming an approximate U shape. The presses as they appeared before remodeling are shown in Fig 1. It can be noted how the upright sections were restrained from spreading by the two steel stay rods, each of which were 4 in. in diameter. This, to Madison Kipp, was an important element in this job. They had a piece of die casting work which had to be gotten under way but which was too large for their existing equipment. Their presses were too narrow between the 4 in. diameter stay rods to permit the use of as large a die block as was necessary to make the proposed die casting.

Their original intention was to obtain new steel castings. Delivery, however, was quoted at over eight months, making this method of revision out of the question. After several unworkable proposals had been suggested by other welding firms, we decided that it was possible to cut out the old stay rod holes, and to put in their place solid steel ears beveled from both sides so that a weld could be effected clear through the casting. Details of our plan are shown in the drawing, Fig. 2. An opening of $\frac{3}{16}$ in. to $\frac{1}{4}$ in. was to be left at the extreme bottom of the V for a completely homogenous wall clear through the section. Hot rolled steel sections 6 in. and 8 in. through were shape cut and beveled. The old holes were cut away. We proceeded to lay in successive beads, carefully peeling and cleaning after each path. A No. 5 rod was used to lay in the root of the weld because of its deep penetrating qualities. When the root was built up, the No. 8 rod was used for successive layers because of its speed and forming properties. We kept the welding progressing constantly until the particular ear was welded completely.

When all the welding was completed, we stress relieved the completed unit outside in the yard in a loose brick furnace by using kerosene torches, heating the welding ends to approximately 1250 F and allowing to cool slowly. The welding of the ears cost the manufacturer $700 per unit, far below the cost of steel castings weighing in excess of 6000 lb plus the cost of complete machining. A total of four machines have now been converted. Delivery on each was accomplished in less than a month, allowing the company to be in production a full ten months ahead of any other proposed method.

This article was taken from an original paper presented in the 1947 James T. Lincoln Arc Welding Foundation "Design for Progress" competition.

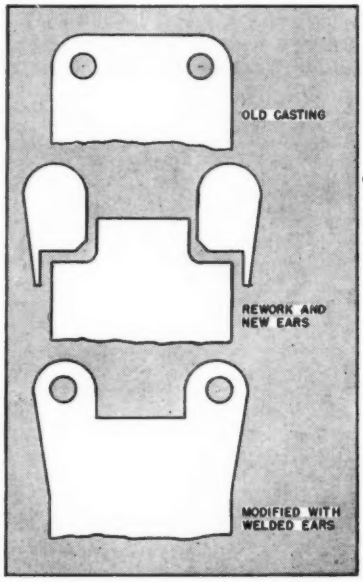


Fig. 2. This series of three drawings shows, at the top, the old die casting with the staybolt holes in place; the drawing in the center shows how the staybolt holes were cut out and the ears welded into place. The bottom drawing shows the ears welded into place and the staybolt holes elevated and widened to meet the new requirements

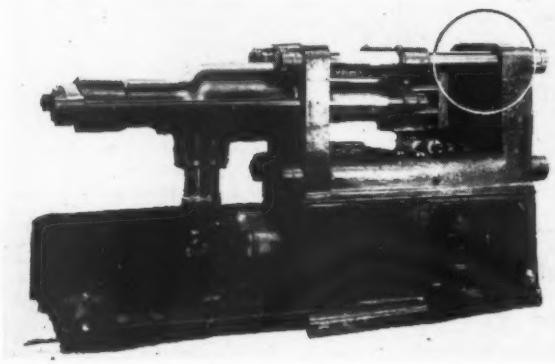


Fig. 1. This is one of the old die casting machines which had to be remodeled in the plant of Madison Kipp Corp., Madison, Wis. Note the comparatively limited space available between the staybolts

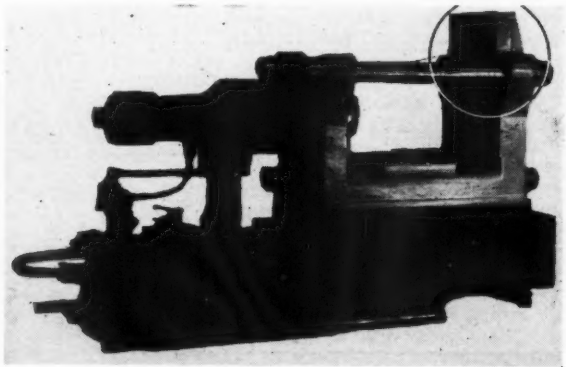


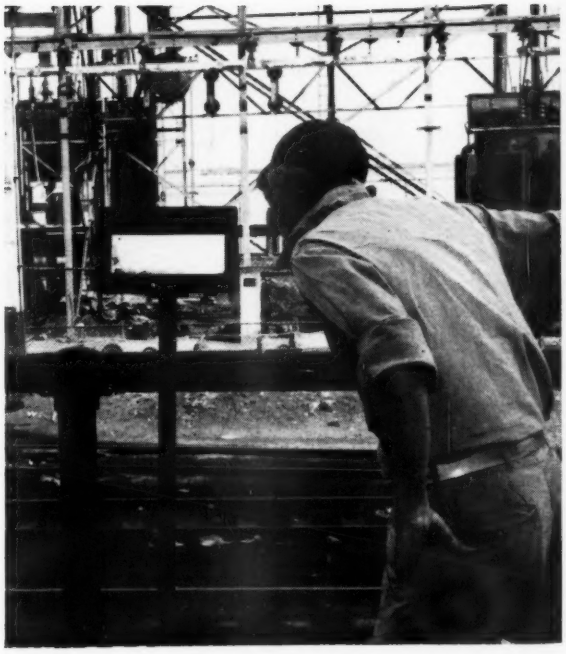
Fig. 3. This photograph shows how the die casting machine looked after it had been completely remodeled. Sufficient room has now been provided between staybolts to permit use of the larger die blocks

How to Keep an "Eye on the Sky"

Contributed by
Union Electric Co. of Missouri

THE ONLY WAY to tell for sure that smoke is coming out of a stack is to look at it. Science—so they say—has come up with some smoke detectors which in some instances have proved as effective as eyesight for detecting smoke. But in most plants if the operators want to know if efficient firing is taking place they will have to look at the stacks. This is true at Mound Street station.

Someone, however, figured out a neat gadget to save the steps of the firemen and the operators. They placed a mirror in such a way that the interested parties had only to step out of the door and glance at the mirror. This was of considerable help during last year's flood. If the mirror hadn't been in place the men would have had to stand in water up to their knees to get a gander at the stacks.



The mirror outside the Mound St. station of Union Electric Co. of Missouri saves steps and shoe leather for the boiler operators

Lights Go Up 8 Ft—Drill Goes Down 3 Ft

Contributed by E. A. Zeibarth

ZEIBARTH Contracting Co., Long Beach, Calif., had the job of drilling a series of perfectly round, 6¼ in. diameter holes, 3 ft down into concrete pavement, frequently through abandoned cable and electrical conduit. It was accomplished by large size, rotary concrete drills.

When the City of Los Angeles decided that the lighting along Hollywood's famous "Radio Row" was inadequate, the 18-ft high light standards then in use were to be replaced with 26-ft high lights. However, the new standards were of a slender, modern design and had to be reinforced. The reinforcing posts needed anchoring, necessitating the holes.

We soon discovered the remnants of former light posts—cable, steel pipe, electrical conduit. The drills went right through everything, though. In straight concrete, the drill bits when mounted in the special rig made the 707 cu in. cut in 25 min. On one hole when an upright piece of pipe had to be cut squarely down the middle, the job took an hour. The drill which we used on these jobs is made by Rotary Concrete Drill Co.

Fig. 1. E. A. Zeibarth, left, and J. H. Peters use this specially-mounted rotary concrete drill to put a 5¼ in. hole 3 ft down into a concrete pavement

Fig. 2. A perfectly cored, 6¼ in. dia hole is being cut in concrete pavement by this drill and it took just 25 minutes to complete the job. Note core sample

Softening Cooling Water for Diesel

Contributed by L. E. Madsen

SCALE IS A common and vexing problem where hard water is used for cooling. As the water becomes heated it tends to lay down the so-called "lime scale" which accumulates on tubes, in valves, in pipe lines, and on the cooling tower. Besides clogging the valves, pipe lines and equipment, this scale acts as an insulator, cutting down the heat-exchange efficiency of the unit under consideration.

Conversely, corrosion is invariably a problem where soft water is used. The problem at the municipal power station, North Branch, Minnesota, was scale in the cooling water system for diesel engines that drive the generators. Municipal water is used for make-up and it is hard—16 grains per gallon. As a consequence the scale was thick: upwards of ⅜ in.

Mechanical and acid cleaning proved to be a temporary solution at best as the heat-exchange efficiency of the units suffered between cleanings. The solution to the problem proved to be a slowly soluble glassy phosphate, automatically fed to the water in a container of wire mesh submerged in the cooler sump. This chemical, known as Micromet, proved to be so effective in inhibiting scale formation that the planned addition of more cooling capacity last summer—an expenditure which the municipal light and power commission had believed unavoidable—was found to be unnecessary. By being able to keep our cooling coils clean we were easily able to cool during the hottest weather.

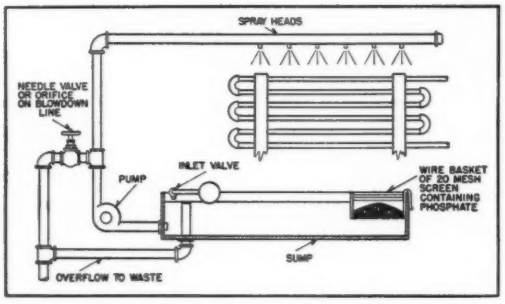
We had a basket or container made of wire mesh and submerged it a few inches below the water level in the sump of the cooler. The phosphate was placed in the basket, and the chemical slowly dissolved to maintain the necessary concentration required to hold the scale-forming salts in solution in the cooling water.

The phosphate dissolves at a constant rate of approximately 25 per cent per month, regardless of how much water is passed through or over it. Thus for every pound required to treat a month's supply of water, the feeder (in this case, the wire mesh container) is initially charged with four pounds of the chemical—of which one pound will dissolve and be introduced into the circulating water during the month.

To maintain the treatment it is only necessary to replenish the supply once a month. For scale prevention it is common practice to employ a one-pound initial charge for each 200 gal of make-up water used per day, with a monthly quarter-pound for each pound of initial charge.

In the treatment of such systems where the water evaporates, it is necessary to provide some blowdown or wastage to prevent excessive concentration of scale-forming salts.

As the water supplied from the North Branch city wells for use in the power station contains 16 gpg of hardness as $CaCO_3$, it was determined that it would be necessary to blow down twice as much water as was evaporated. Based on the volume of make-up water used per day, the treatment required an initial charge of four pounds of Micromet and a monthly recharge of approximately one pound.



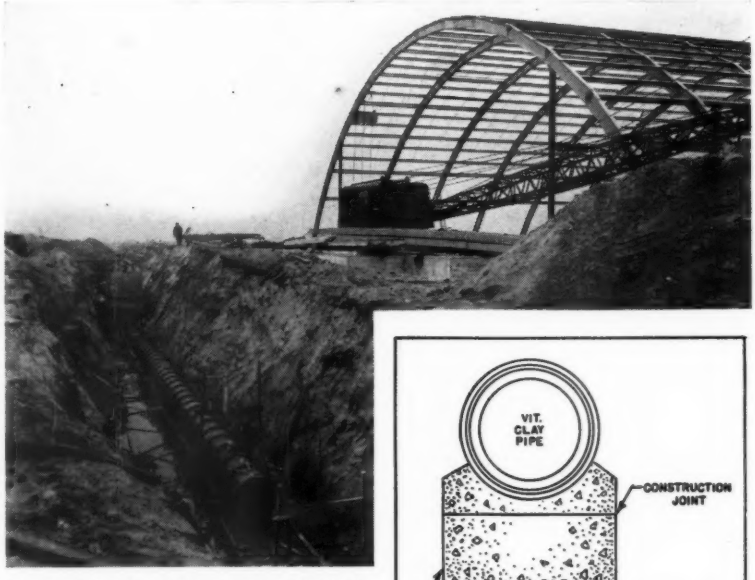
This drawing shows how the wire mesh basket containing the water softening agent is placed in the Diesel engine's cooling water sump

Aside from making of the simple wire mesh containers and supplying the amount of the chemical required initially, nothing is required for the scale-control treatment except the addition of chemical once a month. This simplicity and ease of use make the treatment a convenient solution to lime-scale and corrosion problems. No testing is necessary once the treatment has been established.

The action of the chemical is one of keeping scale-forming salts in solution, so that they do not precipitate and deposit as scale on cooler tubes or other parts of the system. The same chemical is effective for corrosion control in cooling systems, air washers and humidifiers, and refrigerating systems, where the water used is soft.

The effectiveness of this chemical in inhibiting corrosion lies in its ability to provide a protective film of the chemical on the surface of the metal. The protective film is so extremely thin it is practically invisible and does not interfere with heat transfer.

Pipe Cradle for Use in Sandy Soil



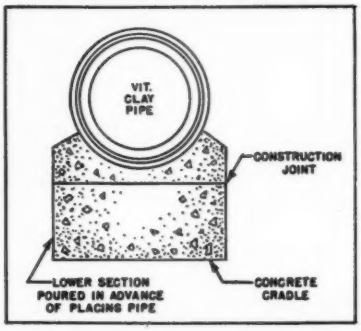


Fig. 1. This photo shows a typical installation in sandy soil. The pipe is laid in a deep cut at Idlewild Airport and shows the construction of a concrete cradle to hold the pipe. In this case the cradle is poured partially in advance of the placement of the pipe to insure proper alignment when finished. The foreground of the photograph shows the top of the first stage of placing the cradle and exposes the plane of the construction joint. Fig. 2. This sketch shows a cross-section of the cradle and pipe referred to in Fig. 1.

Maintenance and Operation

Short practical articles telling how to do things easier, faster and better. Tell your fellow engineers how you solve your problems and read how they solve theirs. Contributions published will be paid for and, upon request, name and company connection will be withheld

What Counts Most in Plant Maintenance?

PROPER lubrication of machinery should head the plant maintenance list. This does not mean just going around with a grease gun at regular intervals. More important is using the proper grease or oil for each machine. Examples are having a low melting point grease in the cool running bearings, and a high melting point grease for bearings running in warm places.

If the factory temperature is high, it would be wise to use greases that have some graphite in them.

When new machinery is installed, have the maker's representatives draw up his recommendations on a chart for the correct oils and greases to use. Use that chart also to record how often each part requires oiling and greasing.

The sense of hearing can be used to good advantage by the plant maintenance man. He can usually detect when a machine in motion does not sound just right. The correction can be made then and there. This timely action will avoid a major repair job later on.

The maintenance man, if he is at all versatile, will make innumerable gadgets to save time and money on such operations requiring the use of conveyors and industrial trucks.

Another way the maintenance man can earn his "keep" is checking the overloads or thermo switches on machines. This will give motors full protection, for burnt-out motors cost real money to repair.

Most machines have comfortable speeds, at which they will operate efficiently for a long time. But speed up such machines, and they will fail too soon and too often. The plant engineering department must be allowed some say in this all-important matter of speed of any given machine. They are held responsible for breakdowns and failures—and the inevitable costly repairs.

The ideal maintenance man should be a qualified engineer. He will then be able to talk intelligently about boilers and steam. He can save the plant money by making certain the boilers are being taken care of—the flues kept clean, the correct water treatment to ensure freedom from scale.

Too often a minor repair job is reported by word of mouth, and passed down the line—and then forgotten—it is never relayed to the maintenance man. If the first man to discover the defect is required to write the record in a book chained to a nearby rack, many a major breakdown will be prevented. It should also be the plant engineer's duty to check over these record books once a week with the reporting parties.

Canada — H. LIVERMORE

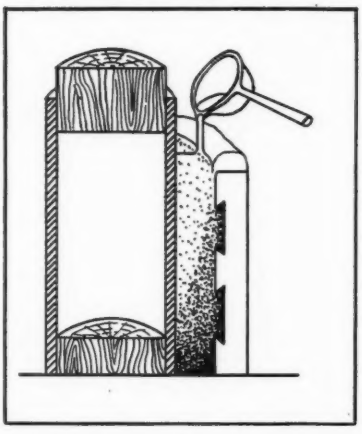
How to Pour Babbitt Bearings

Contributed by
B.J., Syracuse, N. Y.

BY FOLLOWING a few basic rules, sound, dependable babbitt bearings capable of giving long life are easily prepared. The process may be divided into five steps:

(1) Preparation of the bearing and the mandrel; (2) Melting the babbitt; (3) Heating the shell; (4) Pouring the metal; (5) Cooling and removing the mandrel.

First, the bearing shell should be cleared of dirt and all babbitt, making sure that the corners of the anchors are not filled in. A mandrel should be slightly smaller than the shaft for which the bearing is being made. A thin wall mandrel is preferable. It is desirable to plug up the ends of the mandrel so as to retain the heat. The bearing should then be placed on the solid surface with the mandrel braced in place and the lower edge sealed with clay to retain the molten metal.



Illustrating the general procedure for pouring of babbitt bearing, a thin walled mandrel closed with wooden plugs is preferable

Temperature of the molten metal is important. Thick, heavy bearings can be successfully poured at lower temperatures than long thin bearings. Generally, from 850 to 900 F will answer the purpose. The metal should pour like water and for most services, the correct pouring temperature can be determined by means of a small, dry, pine stick. When thrust into the metal it should burst into flame immediately. Slightly higher temperatures are not harmful but accentuate the accumulation of dross from oxidation. The amount of metal melted should be sufficient to pour the complete bearing without stopping.

Before the bearing is poured, the shell should be warmed to a temperature of about 200 F to drive out moisture and avoid chilling of the molten metal.

The space should be filled completely and as rapidly as practical. The bearing shell should then be cooled by applying wet rags or water from the bottom and gradually working upward.

This causes the metal to start solidifying on the surface of the shell, and adheres tightly to it. As the babbitt sets and contracts in this area, the void is filled with hot metal from the mandrel side.

When the metal has completely cooled and set, the mandrel should be removed and the bearing finished. If the bearing has been properly poured, the mandrel will not stick.

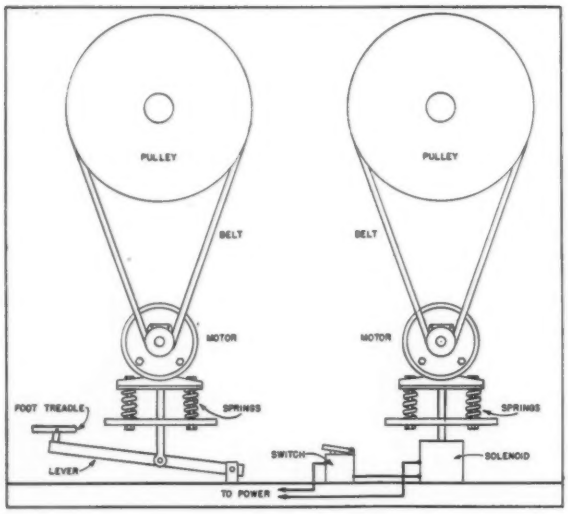
How the Solenoid Whipped a Mankiller

Contributed by
H. B. McDermid

A SMALL SHOP engaged in the repair of fractional horsepower motors had an armature winding machine that was the despair of the shop's management. No one but a husky young man could find enough physical stamina to operate it all day long. And it was almost impossible to find a husky young man who would punish himself to this extent.

The main elements of the machine were much like the headstock and tailstock of an ordinary engine lathe; a two-part jig was mounted on the machine. This jig was curved to fit the body of the armature and hold it firmly, with the shaft of its motor at right angles to the axis of the winding machine. A pair of slots were exposed so that they could accept the new coil of wire. One slot was placed on each side of the armature body so that when the spindle was rotated the wire could be wound into the pair of slots until the needed number of turns were in place.

The work required that the machine then be brought to a stop as quickly as



The sketch at the left shows how the armature - winding machine was powered and the manner in which the power was initiated. The drawing at the right shows the revised method of letting the solenoid do all the heavy work

possible. This was done by an adjustable cam which, when tripped shut, applied a brake to a train of gears. The driving motor of the machine was set directly under the shaft to which it was V-belted. It was mounted on a spring-supported platform (as shown in the sketches) the springs of which were powerful enough to toss the motor and its driving pulley up out of the V-belt when the mechanical lock was released.

This arrangement allowed the driving motor to coast to a stop while the rest of the machine was quickly stopped by the cam-actuated brake mentioned above. The operator then cut off the insulated wire in the slots which had just been wound, released the tailstock and started over again. When the set-up had been made he again pressed down on the foot treadle and the cycle was repeated. This occurred several times a minute and the operator got pretty tired from the constant effort of keeping the heavy springs under compression.

The author, when he was called upon to rearrange the device, took off the mechanical foot lever and replaced it with an electric switch. The switch, when closed, energized a solenoid which pulled the starting mechanism into action. Once fitted and adjusted it needed only the slightest pressure to start the action of the winding mechanism. This relieved management of the necessity of constant hiring in order to find a fairly well trained man who could and would stand the punishment inflicted by the mankilling springs.

Adjustable Nipple Holder

Contributed by
Sam Williams

THE NIPPLE holder shown below may be used to hold pipe nipples and short machine studs while threading the blank end when the other end has already been threaded. The nipple holder, sometimes called a nipple chuck, may be easily made from round stock and is readily adaptable to suit the specific needs of any maintenance man. It may also be adapted to fit any type of threading machine.

The threaded work is easily removed from the holder by simply loosening the end collar. The stop is adjustable for any length of work, and may be

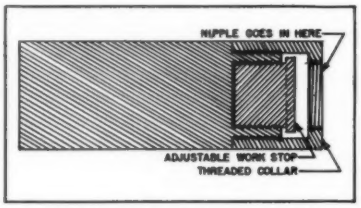


Fig. 1. Adjustable nipple and stud holder, made from scrap to suit the needs of any shop

secured in place with a set screw if desired. The chuck is used by simply loosening the collar, screwing in the unfinished work, tightening the collar, and then threading in the usual manner. The collar is then backed off the body of the holder, and the work removed.

Five Simple Tests for Lubricants

Contributed by
W. F. Smith

THE FOLLOWING are five simple tests for determining comparative values of lubricating oils for journals that require staying power, film strength and efficient transmission. Any lubricant user can easily make them. Tests No. 1 and 2 demonstrate staying quality. Test No. 3—shock resistance. Tests No. 4 and 5—lubricity. In performing these tests no "laboratory equipment" whatever is required.

Test No. 1—Dip your thumb and forefinger into the lubricant. Open and close the finger and thumb and note how the oil adheres. Its adhering property is an indication of whether or not it will run out of the bearings. Adherence is desirable in many bearings, as most readers doubtless know.

Test No. 2—Place equal-sized drops of two oils having the same viscocity on a plate glass. Tip the plate to a nearly vertical position. The oil showing the greater resistance to flowing down the plate is preferable.

Test No. 3—Place on a steel plate equal-sized drops of two or more oils having the same viscocity. Hit each drop with a hammer and note how the oil is flattened out and splatters. The oil that does not splatter is preferable because it is most likely to prevent metal contact under severe shock loads.

Test No. 4—Place a small quantity of the oil in the palm of your hand and rub vigorously. A thin clear film should adhere to all surfaces touched and should not be rubbed away. There also should be an absence of frictional heat.

Test No. 5—Place the lubricant in an open-mouth jar. Dip a wide piece of metal or cardboard into the oil and then lift it above the jar to a height of from 12 to 18 inches and note the film. The broader the jar and piece of metal, the broader will be the film. Ordinary mineral oil subjected to this test will flow from the plate rapidly and splash and splatter. A first class lubricant will flow off in the form of an even film and will not splash or splatter.

For Uneven Pressing, Use Bag of Shot

Contributed by
W. F. Schaphorst

SOMETIMES it is desirable to press a sticker or gummed label upon an uneven surface or to do similar pressing on uneven surfaces. There is hardly anything handier for this purpose than a small bag of fine shot. Mercury is better, but of course mercury is much more expensive and under high pressure may be forced out.

When extreme pressure is wanted the bag of shot may be placed between the surfaces to be pressed with an additional weight on top. The pressure is then evenly distributed over the entire area, something that cannot be accomplished with a flat pressing surface or even with ordinary soft surfaces. A bag of shot kept about the room or wherever pressing of this nature is done often comes in handy.

Ball Bearing Center For a Lathe

Contributed by
S.W., Pawling, N. Y.

THIS BALL bearing center needs no lubrication, is well suited for long, heavy cuts or light, high-speed cuts. The work runs very easily on the ball bearing center, does not get hot, and makes an ideal set-up for grinding in

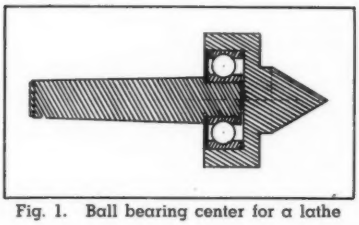


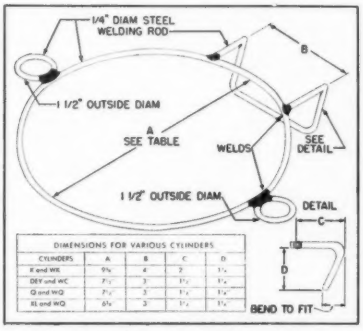
Fig. 1. Ball bearing center for a lathe

the lathe. It can easily be made out of relatively small stock.

Cylinder Clamp from Steel Welding Rod

Contributed by
Linde Air Products Co.

The cylinder clamp shown below can be easily made from some steel welding rod for about 15 cents. First heat and shape the rod around a length of pipe; then weld it as shown in the sketch below. The large ring fits around the oxygen cylinder and the hook clamps over the acetylene cylinder. A chain or wire may be run around a pipe or post and fastened to the small eyes as a rigid anchor for the cylinders. The table can be altered for smaller cylinders.



DIMENSIONS FOR VARIOUS CYLINDERS

CYLINDERS	A	B	C	D
K and MK	9¾	4	2	1¼
DK and MC	7½	3	1½	1¼
Q and MQ	7½	3	1½	1¼
KL and MQ	6¼	3	1½	1¼

Fig. 1. Details of cylinder clamp and dimensions for various sized cylinders

Fig. 2. Attach a chain to a support and the cylinders will stay upright

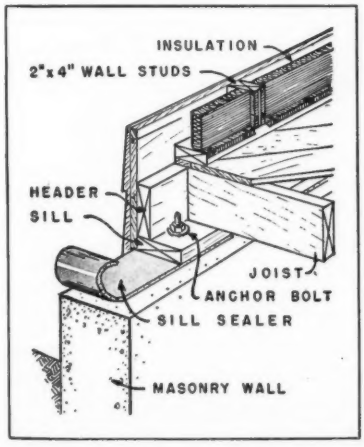
Questions and Answers

An open forum for the discussion of, and airing of opinions on, questions of interest to plant engineers. Send in your questions or problems to be answered and discussed by practical men in the field. Answers to, and discussion of, questions are solicited. Material selected for publication will be paid for and, upon request, name and company connection will be withheld

What Prevents Air Leakage Around Sills?

Contributed by
K.M., Buffalo, N. Y.

QUESTION: One of the buildings in our plant was constructed during the war. It is single-story construction and basementless and during the winter months the wind whistles through cracks which have appeared between the sills and the concrete floor. We are planning another building similar to this one but we want to cut down heat losses at this point. What can you recommend?



Method of using scaling strip between sill and foundation

ANSWER: The reason for the air leakage at this point is most likely the fact that the sill was set in fresh cement mortar. This makes a good seal for a short period of time but eventually the sill absorbs some of the moisture from the cement and later dries. The cement mortar dries too and this leaves a small crack between the two.

There is available on the market felted types of sill sealers which provide resilient seals which effectively prevent the passage of air and loss of heat regardless of how much shrinkage there is in the cement mortar. The drawing shows the generally accepted method of applying this type of sill sealer.

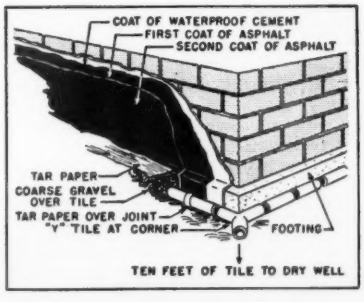
Waterproofing Foundations

Contributed by
T. G., New York

WE ARE HAVING difficulty in a small building built recently in keeping the shallow basement dry. We have tried sealers and a coating of waterproof cement, but apparently this has not been too effective on the cinder block construction. What can be done to rectify the condition?

IF THE CORRECTIVE measures warrant the expense of a first-class job, it will be necessary to do two things. First, drain the ground water away from the foundation; and second, add adequate sealing to the outside.

A trench should be dug completely around the foundation and down to the footings. Coat the entire foundation, including the footings, with a good coat of waterproof cement, after washing off well with a hose. Then apply two coatings of



Construction of waterproof foundation

asphalt, allowing the first to start to harden before applying the second.

When the asphalt is no longer sticky, cover the bottom of the trench with a couple of inches of gravel or crushed stone of about 1 in. size. On this lay 4 in. vitrified drain tile, completely around the foundation and sloping at least one-quarter inch per foot.

At the lower corner join the tile with a Y with a draw in the drain line sufficient to carry the water away. If there is not adequate slope to give good drainage, run the drain line 10 or 15 feet out and into a dry-well of 50 to 100 gal capacity.

Cover the joints of the drain pipe, which should be about one-half inch apart, with tar paper and cover the tile with 6 to 8 in. of gravel or crushed stone. It is well to put a layer of tar paper over the crushed stone before filling in the trench.

If there is leakage through the floor, it may be necessary to add an asphalt sealer and then 2 or 3 in. of concrete. A space of from one-half to one inch should be left around the wall to be filled in later with asphalt.

What Made the Conveyor Run So Fast?

Contributed by
W. J. Neely

QUESTION: In the November issue on page 67, Robert Baker told of an experience with a rewound motor that was driving a bucket conveyor. When first hooked up the motor ran so fast that the conveyor buckets were just a blur. After changing the hook-up the motor ran at normal speed but it ran backwards. On the third hook-up the motor operated correctly. Mr. Baker's question was answered in the April issue. Below is presented another plant engineer's answer.

IN THE APRIL issue you have an answer to a question regarding some difficulties in a conveyor which was driven with a direct current motor, apparently shunt wound.

In the first instance, with an incorrect hook-up, the conveyor operated at an excessively high speed, and the reason assigned for this was that the shunt field was connected in series with the armature giving the motor series, instead of shunt, characteristics.

I am inclined to the opinion that this explanation is incorrect. A shunt field is of sufficiently high resistance to operate normally across the line, that is, at high voltage, and a normal shunt field current is considerably below the full load rating of the motor. So this high resistance shunt field, being in series with the armature, would hardly allow sufficient current input to give the required torque.

I am inclined to the opinion that if this was a shunt motor, that the difficulty in the first instance was due to the shunt field being open, which gave a very weak field. In fact, the only field available would be due to the residual magnetism. In a case like this, if the motor had torque enough to start, the speed would be excessive.

Plant Engineer's Digest

Short articles selected from current publications and condensed for quick reading to save time and give a timely review of a wide range of industrial topics

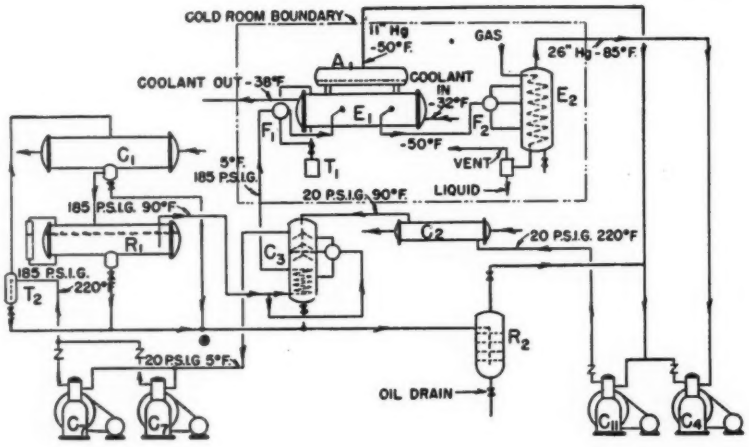
Low Temperature Refrigeration

THE LOWER the temperature the greater are the problems in the design of a refrigerating plant. A low temperature can be obtained only by lowering the expansion pressure of the refrigerant and therefore the lower the desired temperature the lower the density of the expanded refrigerant gas (lb per cu ft). Since the refrigeration effect produced depends on the weight and not the volume of the refrigerant handled, it is obvious that any low-temperature plant must circulate large quantities of low-pressure gas. For this reason, a refrigerant for a low-temperature installation should have a relatively high vapor pressure to decrease the size of compressors and the capital investment.

Below their critical temperatures, all refrigerants will have approximately the same compression ratio for a given evaporator temperature and condensing temperature.

A 40-t plant operating at —55 F was designed and installed by the author using a two-stage compression system to replace a single-stage compression system. The replacement effected a saving of 35 per cent in power requirements and approximately 50 per cent in capital investment in the plant. The schematic diagram shows this two-stage system to which was added a third stage compression to handle a small load of 0.1 ton at a temperature of —85 F.

Lower operating cost is obtained



A_1 = Accumulator on surge drum.
C_1 = Shell and tube condenser.
C_2 = Intermediate discharge shell and tube cooler.
C_3 = Liquid discharge inter-cooler.
C_4 = 4" x 4" Standard ammonia compressor on L.P. stage with light weight suction and discharge valves.
C_7 = 7" x 7" Std. ammonia comps., H.P. stage.
C_{11} = 11½" x 8" Standard freon booster compressor on the I.P. stage.
E_1 = Shell and tube heat exchanger.
E_2 = Coil type heat exchanger.
F_1 = Float valve on E_1.
F_2 = Float valve on E_2.
R_1 = Liquid ammonia receiver.
R_2 = Ammonia oil rectifier.
T_1 = Oil trap on equalizer line to float valve.
T_2 = Oil trap on discharge of C_7 compressors.

This drawing is a schematic diagram of the multi-stage low-temperature system designed by the author

as a result of the following efficiencies: (1) increased volumetric efficiency due to multiple-stage compressions; (2) removal of much of the heat of compressions by cooling between stages with water; (3) cooling the liquid refrigerant down to the suction temperature of the high-stage compression instead of doing all of this cooling at low suction pressure. Thus the volume of flash gas in the evaporator is reduced.

The lower capital or first cost expenditures is due to: 1. The low-stage compressor being built much lighter since its function is to handle large volumes at low pressure; 2. Decreased motor size due to lower power requirements as outlined above; and 3. Decrease in the required displacement of the high-stage compression due to the density of gas handled being 2 to 4 times greater after first-stage compression. *—By H. B. Warner, Consulting Engineer, B. F. Goodrich Chemical Co., in Engineering Experiment Station News, published by the Ohio State University.*

Freight Car Door Accidents

THE OPENING of box car doors is a fertile source of accidents. Fingers are crushed or punctured, slips, strains and falls occur, and men are hit by falling loads when the door is opened or by the door itself if it comes off the track.

Before a box car door is opened, it should be inspected to see that it is properly tracked, that the handle is securely fastened, and that there are no projecting nails or splinters. The door should first be opened only enough for the workman to see into the car, to determine if there is a possibility of danger from a falling load. As a further safeguard, workmen should place themselves in the clear of the opening if there is any chance that the load will topple.

When extra force is applied to jammed doors, they usually come free quite suddenly. A hand on the door post, door step, bottom sill, or the leading edge of the door is almost certain to be injured. To avoid such injuries, the door should be pushed above the guides at the trailing edge of the handle. A small steel bar can be used to pry open a door that sticks, but men should be careful not to lift the door off the upper track.—*(Editor's note—To be safe use a door opener.)*

Precautions must also be taken against slips and falls when doors give suddenly, and against strains from overexertion. In winter, snow and ice increase the hazard of falling. Docks should be kept clear, and when this is impossible, salt, sand, or cinders should be used to guarantee safe footing.

If it is necessary to open a car

Uniformly Better Results in Heat Treating...

● Using the NIAGARA AERO HEAT EXCHANGER to cool quenching bath solutions returns the cost of the equipment quickly and gives a bonus in fewer troubles for the heat treating superintendent.

Controlling the temperature of the quench means a uniform product...fewer rejections. Ample cooling capacity independent of water supply eliminates shut-downs because of hot oil. The heat is transferred from the oil to air by the evaporation of a water spray. Only the water evaporated is used and 95% of the water cost is saved.

In hundreds of installations, quenching both small parts and large shapes, production has increased at lower cost. Units operate reliably for years without maintenance troubles in plants that run 24 hours per day.

Niagara Aero Heat Exchangers also give extra value in cooling jacket water for process equipment or engines, hydraulic equipment, electronic sets, controlled atmosphere processes, and many other applications.

Write for Bulletin No. 96-PE

NIAGARA BLOWER COMPANY

Over 30 Years Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

door which is off the track, workmen should tie or hook a length of rope to the door handle and pull the door open, meanwhile standing in the clear and taking precautions against possible damage in case the load falls.—*From Power Press Safety, a publication of the National Safety Council, Chicago.*

High-Strength Low-Alloy Steels

YIELD STRENGTHS of metals of the high-strength low-alloy steels are approximately 50 per cent greater than ordinary carbon steels. This permits a substantial saving in weights for many types of construction. The relatively low carbon and alloy contents make their forming and shaping qualities similar to simple low-carbon steels at slightly greater cost and with added corrosion resistance due to the alloy content.

Carbon content is usually kept below 0.15 per cent to aid weldability. In a few cases, however, it may be as high as 0.25 per cent. Manganese contents range from 0.30 to 0.80 per cent, as normally found in low carbon steels up to 1.40 per cent. In some steels, silicon contents above average are used for increased yield strength.

Phosphorus content in many cases is higher than usual, while sulphur, on the other hand, is generally kept as low as ordinary steels. The alloying elements include copper, nickel, chromium, molybdenum and zirconium. At least two of these elements are usually present in every commercial product.

Fabrication practices are generally similar to working plain carbon steels with certain exceptions. Forging temperatures should be kept below 2250 F with finishing temperatures as close to the upper critical range as possible. Hot bending of the plate and tubing should be done in the 1650 to 1800 F range to prevent grain growth.

They harden only slightly from above the critical temperature so that no annealing treatments are necessary. For rivets over ⅜ inch in diameter, hot riveting at not over 1250 F is recommended, with cold riveting for the smaller sizes. They may be cut, punched, reamed, sheared and sawed as with low carbon steels. However, the machineability rate is less.

Welding can be done by conventional methods. To obtain high-strength in weld metal, however, the weld-rods should deposit metal of a yield strength equivalent to that of the base metal. Low minimum preheat temperatures are recommended to prevent cracking. Preheating temperatures up to 500 F are used, depending upon the base metal composition and thickness.

Stress relieving temperatures from 1100 to 1250 F should be followed as in plain carbon steel, with a holding time of about one hour per inch of thickness, followed by furnace cooling. *From Tempil Topics, a publication of the Tempil Corporation, New York City.*

Checking Steam Jet Ejectors

WHEN A STEAM jet ejector is producing an unsatisfactory vacuum after having produced a satisfactory vacuum for a number of months or years, it is the maintenance man's job to make the necessary changes or repairs.

First, make certain that there has not been a gradual change in operating conditions. The steam pressure should be checked at the ejector steam chest with a gage which has been calibrated from about 20 lb lower to about 20 lb higher than the expected operating steam pressure. For example, supplying a recently installed steam-using piece of equipment on the same steam line as the ejector may have caused a drop in the steam pressure in the line. Also, check the temperature of the condensing water entering the intercondensers, if the ejector is a condensing type, to make sure it does not exceed the maximum temperature for which the ejector was designed. This check will also tell whether the temperature rise is that recommended by the ejector manufacturer (this is usually 10, 12 or 15 F).

Check the exhaust steam line handling the steam discharged from the last stage to make certain that the pressure against which the last stage now discharges has not been increased. If the end of this line is submerged a few inches in a hot well, see that this submergence has not been increased by a recent rise in the level of the water in the hot well. This submergence should never be more than 6 or 8 in.

If a check indicates that operating conditions are correct, next see if the cause of the trouble is in the ejector or in the system. Isolate the ejector, either by closing a valve in the vapor line to it, or by disconnecting the suction line and bolting a blind flange to the suction opening of the ejector, and try operating the ejector on no load.

If it pulls up to an appreciably higher vacuum than it ever maintained when new and this vacuum does not fluctuate, the trouble is in the system. The system should be water-tested or air-tested to find any air leaks, checked for recent overloaded operation, or for excessive gas in a new feed stock.

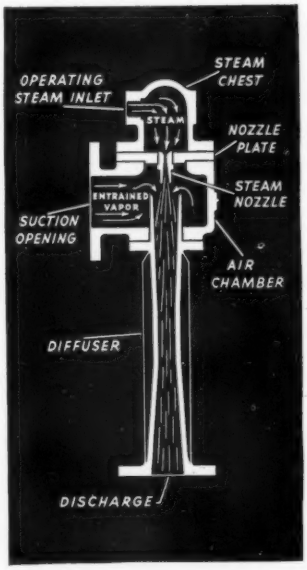
If it pulls up to a higher vacuum, but this vacuum fluctuates, the trouble may still be in the system and not in the ejector. The ejector may be one that was not designed to be stable at shut-off vacuum, that is on no-load operation. However, these ejectors will produce a steady shut-off vacuum if operated at a steam pressure approximately 10 per cent higher than the design pressure. This is also true when they are handling a small amount of gas.

If the ejector, on no-load operation, when operated on about 10 per cent higher steam pressure or when handling about 20 per cent of its guaranteed air component load, does pull up to a high steady vacuum, the trouble is in the system and not in the ejector. If it does not pull up to a high steady vacuum, the trouble is in the ejector. To remedy ejector difficulties, first dismantle the ejector to check for foreign deposits in it, scaling off internal parts, and wear in the nozzle and diffusers.

While steam jet ejectors almost invariably have a much longer service life than vacuum pumps, they will eventually erode, particularly if operated on wet steam. They will corrode if handling corrosive gases, so that they must eventually be repaired.

If the ejector is a condensing type, clean the intercondensers and make certain all parts are in good condition. If the ejector has been handling mixed gases that may include a little vapor, such as fatty acids, napthalene, etc., which congeal at relatively high temperatures, some vapor passages in the intercondensers or tail pipes may be clogged with congealed material which will have to be steamed out.

If an intercondenser has a spray nozzle, make sure it is in good working condition and is not clogged, loose, or out of place. If the exhaust steam line from the last stage is submerged 6 or 8 in. in the hot



Nomenclature of a typical steam jet ejector

well and "hard" water check for scale deposits at about water level in the hot well.

After all stages and intercondensers have been cleaned up, the next step is to take the nozzle and diffusers which have been cleaned and polished, and measure the throat diameters to catch any out-of-roundness; then compare these measurements with the original throat diameters.

If the percentage increase in nozzle throat area is equal to or larger than the percentage increase in diffuser throat area, and the largest percentage increase is 7½ per cent, or less, the ejector stage will probably work reasonably well, but not as well as when it was new.

If the largest percentage increase is between 7½ and 15 per cent, the ejector stage may work, but will probably produce a somewhat poorer vacuum than when it was new and if the largest percentage increase is more than 15 per cent, the ejector stage probably will not work satisfactorily enough and the nozzle and diffuser will have to be replaced.

If the percentage increase in the diffuser throat area is larger than the percentage increase in the nozzle throat area, the ejector stage will not work satisfactorily until the nozzle is redrilled to increase the throat diameter enough to make the percentage increase in its throat area at least equal to the percentage increase in the diffuser throat area. A rather definite indication of a worn diffuser or of an unbalance in wear between the nozzle and the diffuser is the fact that as time goes on it becomes necessary to keep raising the steam pressure on the ejector in order to get it to operate satisfactorily.

In reassembling the ejector, make certain that, if new gaskets are used between the nozzle plate and the air chamber and between the air chamber and the diffuser flange that they are not more than 1/32 in. thick. After reassembly, test the complete ejector for air leaks. Close off enough openings to be able to hold 10 to 15 psig air pressure in the complete ejector. Cover all flanges with soapy water to check for leaks.

Next start up the ejector and try operating it on no load or handling the 20 per cent air component load mentioned above. Start up multi-stage ejectors one stage at a time, starting with the last stage and check the vacuum maintained by each stage before starting up the next one. If the vacuum maintained by each stage is steady and is somewhat higher than that point normally maintained at that point when the ejector was satisfactorily serving its system, the ejector should be able to maintain a satisfactory vacuum.

If the vacuum maintained by a stage fluctuates, it usually means

YARWAY
IRON
SCREWED-END STRAINER
FLANGED-END STRAINER
Easy
TO SERVICE
• A good strainer protects your equipment and pipelines.
Maintenance men said "give us a strainer with a blow-off cap that comes out easily and makes up tight; a screen that can be put back in place without a lot of fiddling around".
• The easy-to-remove Yarway cap meets these requirements. It has straight (not tapered) thread, machined face and spark-plug-type gasket. Permits easy removal for cleaning. Insures proper screen alignment when replaced in body.
• Screen itself is of high grade woven monel wire, or perforated if desired.
• Body of strainer is iron or steel, cadmium-plated for protection against corrosion and for better appearance.
• Available in six sizes, ½" to 2", for pressures to 600 lbs. Reasonably priced. Hundreds of thousands in use. Stocked and sold by 150 Mill Supply Houses.
• See your dealer or write for Bulletin S-201.
YARNALL-WARING COMPANY
145 Mermaid Ave. Philadelphia 18, Pa.
YARWAY STRAINERS
"Police the Pipelines"

the diffuser of that stage was a little too badly worn for the above procedure to fully compensate for the wear and the diffuser should be replaced with a new one.

To sum up: Wear in diffusers is more critical than internal wear in nozzles. Wear in a nozzle tends to compensate for wear in the diffuser. In case of doubt as to the effects of wear, order a new diffuser first, since a new diffuser will operate with a nozzle a little worn, while the effect of replacing a worn nozzle with a new one is to make operation worse if the diffuser is worn. You can operate with a worn nozzle and a new diffuser, but not with a new nozzle and a worn diffuser. Always replace a worn diffuser with a new one; experience shows that attempted repairs to worn diffusers are unsatisfactory.

If, in an emergency, it is necessary to try to keep an old ejector in stable operation, try raising the steam pressure at the ejector to see if it will operate stably at some higher steam pressure. If necessary, and possibly temporarily, set the boiler safety valves for a little higher pressure (perhaps at night or on Sunday).

If the ejector operation is stable on a higher steam pressure try, by slowly reducing the steam pressure, to determine the exact minimum steam pressure at which each individual stage of a multi-stage ejector will operate stably, starting with the last stage first, then the next-to-last, and so on. Next, figure the percentage increase of the minimum stable operating steam pressure of each stage expressed in pounds absolute, not pounds gage, over the original design steam pressure, also expressed in pounds absolute.

Then redrill the nozzle of each stage requiring higher steam pressure to give this same percentage increase in nozzle throat area. This usually permits the ejector to operate stably on a minimum steam pressure equal to or slightly higher than design pressure—*By L. F. Stinson, Heat Transfer Dept., Elliott Co., Jeannette, Pa., in Powerfax, a publication of Elliott Co., Jeannette, Pa.*

Plant Engineer's Library

Centrifugal Pumps

Centrifugal and Axial Flow Pumps by A. J. Stepanoff. First edition; 428 p.; illustrated; size 6 by 9 in.; cloth bound. Published by John Wiley & Sons, Inc. Price $7.50.

Since few of the books on centrifugal pumps give an adequate account of the progress of art during recent years, or deals with problems arising from new practices and uses of pumps, the author has prepared this book in an attempt to cover these phases. Points are explained clearly and with a minimum of mathematical complication, and drawings are practical and clear.

The book should be very valuable as a working manual for consulting engineers and plant designers. It covers the subject under the following chapter headings: Selected Topics from Hydraulics; Definitions and Terminology; Theory of the Centrifugal Pump Impeller; Vortex Theory of Euler's Head; Specific Speed and Design Constants; Design of Mixed Flow Impellers for Centrifugal Pumps; Pump Casing; Axial Flow Pumps; Hydraulic Performance of Centrifugal Pumps; Leakage, Disk Friction, and Mechanical Losses; Axial Thrust; Cavitation in Centrifugal Pumps; Special Operating Conditions of Centrifugal Pumps; Special Problems of Pump Design and Application; Shaft Design for Critical Speeds; Special Problems and Applications of Vertical Turbine and Axial Flow Pumps; Special Problems and Applications of Centrifugal Pumps; and Centrifugal-Jet Pump Water Systems.

Any book advertised or reviewed in this issue may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill. Only books published in the United States for delivery in this country are available from the Book Department.

Manual for Control and Instruments

Instrument and Control Manual for Operating Engineers by Eugene W. F. Feller. Size 6 by 9 in.; 426 p.; illustrated, cloth bound. Published by McGraw-Hill Book Company. Price $6.00.

For a long time a book of this type has been badly needed in the power plant field. Much of the literature on instruments and controls deals with the theories of control and too little of it with the practical equipment used in solving specific metering and control problems. This book meets the latter need very successfully.

It explains the basic principles of control and instrumentation, describes the construction and operation of liquid level, pressure, temperature, speed and humidity indicators and controllers. After dealing with the individual units that make up a complete control system, the author shows how they are connected together and how the operation of one unit effects that of another. He devotes considerable space to explaining the operating fundamentals of each primary element. One of the outstanding features of the book is in the illustrations.

Corrosion and Its Prevention

Corrosion Handbook edited by Herbert H. Uhlig. First edition; 1188 p.; size 6 by 9 in.; cloth bound; illustrated. Published by John Wiley & Sons, Inc. Price $12.00.

Corrosion has always been important, but in the modern world the cost of destruction by corrosion forms an appreciable proportion of our national income. The cost involves not only the replacement of metal destroyed by corrosion but also the damage to products by contamination, loss of efficiency and in psychological factors attending the imminent failure or explosion of corroding equipment.

Prepared under the sponsorship of the Electrochemical Society. This handbook is a condensed summary of corrosion information including within its scope a cross-section of scientific data and industrial experience concerned primarily with corrosion protection, the behavior of metals and alloys at ordinary and high temperatures, and briefly, current theories of corrosion and corrosion testing.

The book, of course, is the work of many authors who contributed the various articles on branches of the subject in which they are specialists. The book is divided up into nine separate sections; General Corrosion Theory; Corrosion in Liquid Media, the Atmosphere and Gases; Special Topics in Corrosion as by sea water, by soil, by micro-organisms in aqueous and soil environments, fundamental behavior of galvanic couplings, hot and cold water systems, corrosion by lubricants, etc.; High Temperature Corrosion; High Temperature Resistant Materials: Chemical Resistant Materials; Corrosion Protection involving metallic coatings, inorganic and organic coatings, inhibitors and passivators, temporary corrosion-preventive coatings, fundamentals of cathodic protection, and the application of cathodic protection; Corrosion Testing; and a collection of miscellaneous information on corrosion.

What's Chabazite, Daddy?

Chambers' Mineralogical Dictionary; second edition; 48 pages; 5½ by 8 in.; illustrated. Cloth bound, published by Chemical Publishing Co., Inc. Price $4.75.

This dictionary lists the chemical composition, crystal form, physical and

chemical property, occurrence and uses for over 1400 mineralogical terms. It is beautifully illustrated with 40 colored plates which will help the reader recognize the different minerals. Geologists, mineralogists, metallurgists, and chemists as well as those who use minerals or materials of mineralogical origin will find this volume exceedingly useful.

Alex the Chart Maker

Nomography by Alexander S. Levens. Size 6 by 9 in.; 176 p.; 120 illustrations; cloth bound. Published by John Wiley & Sons, Inc. Price $3.00.

Nomograms or charts are widely used in scientific and technical work to save time in repeated solution of mathematical formulas. The alignment chart, a type of nomograph, has been widely used during the past 20 yr and illustrates the convenience of the form.

Engineers and scientists should be trained to understand the mathematical design and theory of nomograms and know how to construct them for use in their own work and that of others.

In this book the author places emphasis on the geometric method employed in developing the theory for design of alignment charts involving equations of 3 or more variables. Simple equations are solved by alignment charts consisting of straight-line scales, whereas more complicated equations may necessitate the use of grids, curved scales and combinations of Cartesian co-ordinate with alignment charts.

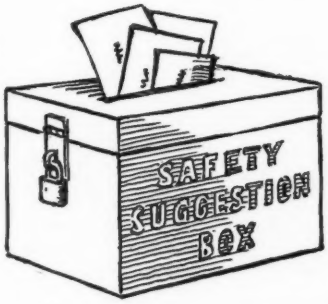
Once the theory is well understood, practical short cuts are presented to reduce the time required to design a chart. A number of examples of these are given a separate chapter.

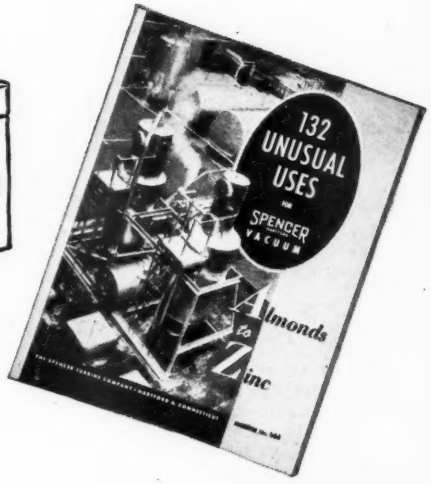
An Introduction to Engineering

Introductory Problems in Engineering by C. W. Crawford. Size 6 by 9 in.; 122 p.; illustrated; paper bound. Published by Irwin-Farnham Publishing Co. Price $1.75.

For a long time engineering schools have been trying to find some way of giving to students entering engineering courses an idea of the nature of engineering principles and work. This book has been written to accomplish that purpose and is planned to show the student the types of problems he will meet in engineering and the kind of thinking required.

It begins with an introductory chapter on the place of the engineer, the function of the various types of engineers, their professional responsibility, and the student's approach to engineering. Then follows specific discussion of exponents and logarithms, the slide rule, dimensional equations, notes on trigonometry, motion, principles of mechanics, equilibrium and friction, uniform acceleration, work, energy and power. An appendix gives tables of common logarithms, sines and cosines, weights of common substances, properties of common areas and solids.





132 NEW IDEAS WITH SAFETY AS AN EXTRA DIVIDEND!

Here is a book full of ideas for accomplishing difficult production tasks with great speed, accuracy, and reduced costs, and yet every one of the suggestions might well be dropped into the Safety Suggestion Box.

For instance, Spencer Vacuum handles hot materials such as ashes and cinders, and cleans out the bottoms of 30 foot car wheel pits while still hot.

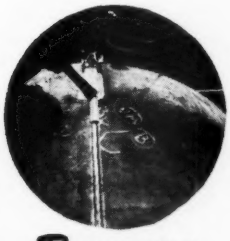
Conveying of chemicals, foods, silica sand and other materials by the ton, is accomplished without scattering dust.

Fumes from autos in repair shops, from welding operations and in chemical plants, are collected at their source.

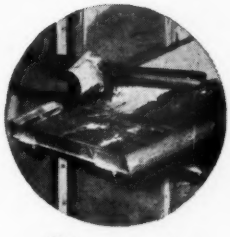
Rock drills used in quarries or for concrete are provided with a hood connected to Spencer Vacuum.

And, with the same Spencer Equipment, floors, walls, ceilings, pipes and all machinery can be kept clean.

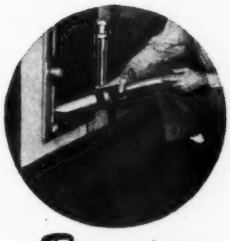
ASK FOR THE SPENCER BULLETIN



Recovering Welding Flux



Chemicals



Removing Cocoa Shells

356-D

SPENCER HARTFORD VACUUM CLEANING

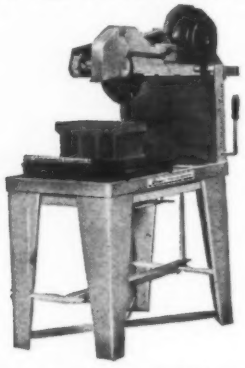
THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

New Products and Methods

(Continued from page 12)

Masonry Saw

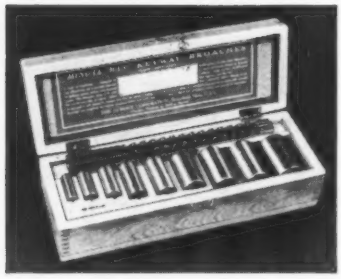
22 The Feedmatic masonry saw has been recently introduced. It is designed for wet operation to eliminate the dust and for the use of diamond blades as well as abrasive blades. This masonry saw operates with a foot pedal or with the head locked in any position for a constant depth of cut. Feature of this new machine is the Feedmatic control to eliminate operator guesswork on blade pressure. An adjustable weight, sliding on the belt guard, is set at the proper position to provide the correct blade pressure for the kind of material to be cut. After the blade



is in contact with the work the pressure is automatically controlled as the blade feeds thru the material. The circulation in the self contained coolant system is provided by a positive displacement rotary pump. The moving elements are made from rubber and stainless steel and the housing is a brass casting. Stainless steel waterjets are built into the blade guard assuring adequate delivery to both sides of the blade. Instant height adjustments for varying material sizes are obtained by a lever-operated toggle mechanism. The headlock for diamond blade cutting is controlled by the operator from his normal position. Track parts of main frame are structural forms and heavy gauge sheet steel with bar stock has been used throughout the all welded main frame and head assemblies. Victor Engineering Corp.

Keyway Broach Kit

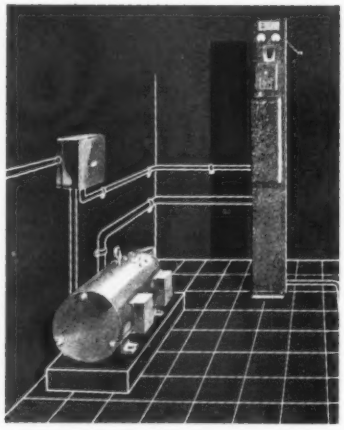
23 Announced are kits for cutting all standard keyway sizes approved by the ASA. The new kits are available with carbon steel broaches and with high speed steel broaches. Bushings are provided for all hole sizes from ½ in. to 1⅛ in. by sixteenths. With the kit it is only necessary to drop the right size bush-



ing in the bore, place the broach of the desired width under the arbor press and in the bushing slot and press it through. The exact depth of keyway is obtained by using shims likewise provided in the kit. The whole job takes no more than a minute. ASA standard keyways are cut in any gear, milling cutter, pulley hub, coupling, collar or other part. Kits are furnished in hardword cases. The du Mont Corp.

Battery Charger

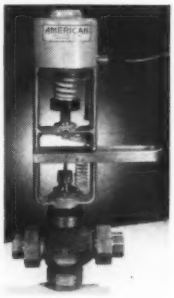
24 This charger consists of a standard single circuit battery charger for servicing one 15 or 16-cell, 350 to 500 amp-hr lead battery. An Exide MP control unit plus a few other control items enables this charger to: Automati-



cally start the charging current at the proper value. Automatically control the charging current to the battery throughout the charge and shut down and disconnect the battery from the generator in case of a power interruption. Automatically restart and resume charging when power is restored, while protecting against reversal of current, or protect against dangerous overloads on both generator and driving motor. It cuts off the battery when it is fully charged, and stops the motor-generator. A full voltage magnetic motor starter with thermal overload protection is mounted on the wall above the nominal 3 kw, shunt wound, battery-charging motor generator. The motor is rated at 5 hp, 1800 rpm, and is designed to operate from a power supply rated at 440 or 220 v, 3 phase, 60 cycles. The motor is also available for 550 v power supply and/or 2 phase power supply. It will completely recharge the specified lead battery within approximately eight hours. Electric Products Co.

Temperature Regulator

25 This snap action temperature limiting regulator is for use on processing machinery where a positive shut off is required when the critical temperature has been reached. The



accuracy of actuation is secured by carefully ground and fitted stainless steel parts. A feature is the ease of manually resetting which is achieved by simply raising the cocking lever. Made in three sizes; ½, ¾ and 1 in. and for temperatures from 20 to 345 F. Manning, Maxwell & Moore, Inc.

Shear Cutting Tool

26 This shearcutting tool is featured with a new circular cutter bit, now made from highest quality high speed steel. Fastened securely to the end of a specially designed holder, the circular cutter bit utilizes a new technique in cutting metal. The penetration angle is such that a shearing action is attained and as a result of this action mirror-like finishes are produced and there is a great reduction in the heat of friction usually produced by conventional tools. The cutter bit presents 20 to 50 new, sharp cutting edges by simply rotating the bit. This eliminates the necessity of stopping production at frequent intervals to resharpen the cutting tool. When resharpening becomes necessary the circular bit is removed and can be resharpened in one minute. There is no worry about proper rake angles as the tool is scientifically pre-formed for optimum cutting. Shearcut Tool Co.

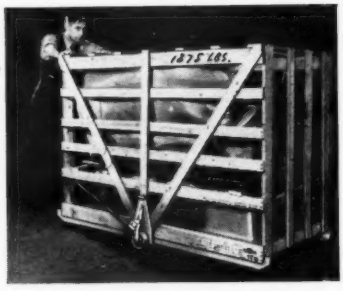
Thermal System

27 Offered is a new single capillary, organic liquid actuated thermal system which is particularly adaptable to applications where: a small bulb is required, short range intervals are desirable, the manufacturing process is sensitive to mercury, or sub-zero tempera-

tures are encountered. The system utilizes a single bore capillary and a single Bourdon spring with a U-shaped bi-metallic compensator on the spring for case temperature changes. Uniform charts are used and the system is available with the usual fittings, armors, etc., as supplied on other thermal systems. Taylor Instrument Companies.

Wheeled Lift Jack

28 A pair of Travel Jacks, recently introduced, can handle loads up to 2000 lb. A simple twist of the toggle arrangement lifts the heavy, bulky load off the floor and puts it on roller bearing wheels. One man can easily ma-

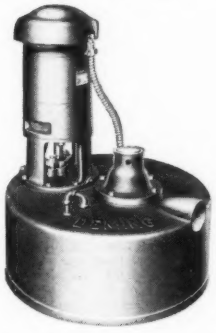


neuver the load into position and gently lower it to the floor. The Travel Jack is compact and lightweight, easy to store and carry. Its versatility is limited only by the needs and ingenuity of the user. The Winkelmann Co., Inc.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10-11 and 42-43

Condensation Unit

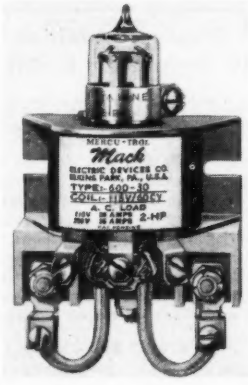
29 These vertical type condensation units are compact needing but little floor space. They are reputed to be able to handle 500 to 10,000 sq. ft. of direct radiation against pressure



from 10 to 55 lb. The centrifugal pump has no close clearances. Because of the jet type construction the unit is said not to vapor lock. The entire pumping unit and jet can be removed from the tank for cleaning, without disconnecting piping. Driving motor is 110-220 v, 3500 rpm, 60 cycles, single phase a c, capacitor type. Automatic control is provided to be operated by dual float. The Deming Co.

Mercury Relay

30 These mercury relays feature the fact that there is but one moving part, which is the free floating magnetic plunger. The plunger and its case are hermetically sealed in with the heavy tungsten contacts. The tube is readily replaceable. Available for motor loads up to 2 hp. The plunger is of special magnetic stainless material with glazed ceramic



liner to assure proper displacement of mercury and high speed operation. The coil is cotton interwoven, varnish impregnated and baked. The sealed in electrodes are 0.080 in. ground tungsten, electrolytically cleaned of oxides and butt welded to Koolgrid nickel stranded lead wires. Mack Electric Devices, Inc.

Coolant Pumps

31 Two new seal-less type coolant pumps, a vertical submerged and a side-wall mounted unit, have been added to the company's Norwood line. In general, these two new pumps, designed for general circulation duty and machine tool applications, are of the low-head, single-stage types close-coupled to the motor. The double-suction, open-impeller, submerged type pump is constructed for vertical operation with flooded suction at all times. Known as the KF type, it is designed for use on machines requiring a large coolant tank. Especially suitable for handling liquids containing considerable amounts of solids, chips or suspended abrasive particles, this pump has no stuffing box. It is particularly adapted for use on

WHY DART UNIONS
Pay Off in
LONGER SERVICE

INSPECT THIS JOINT
It's spherical — the two seats form true bearing surfaces, making a drop-tight *ball joint.*

NOTE THE METAL
It's bronze — both seats are non-corroding and *extra*-wide.

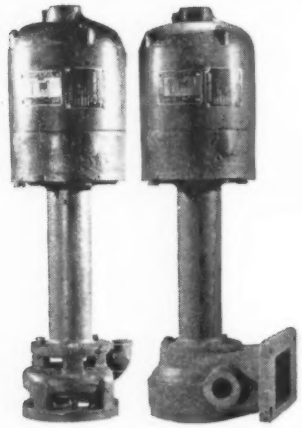
CHECK THE RUGGED BODY
It's extra strong — with shoulders that withstand wrench abuse . . . high-test, air-refined malleable iron body and nut which are practically indestructible.

DARTS
always mean *longer* service at *lower* cost. Their features speak for themselves.

1. 2. 3. 4.

DART UNIONS
E. M. DART MANUFACTURING CO.
PROVIDENCE 5, RHODE ISLAND

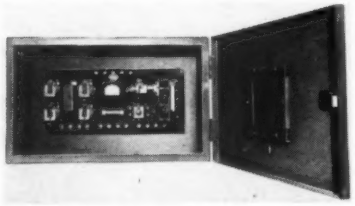
New Products and Methods



boring, drilling, metal cut-off machines, grinders and lathes. The side-wall mounted pump is designed for handling solids, gritty or abrasive particles and is commonly used on grinding and honing machines. This unit, the KW, is available with two different length adapters depending upon the depth of the coolant reservoir. Suction ports of both pumps are located above and below the impeller so that the adapter is always under suction head. This design eliminates the necessity for wearing rings or close clearances on the impeller hub or in the adapter. Impellers of both pumps are of cast, corrosion-resistant, zinc-free bronze. Both pumps are available in ¼ to 1 hp sizes, 1 and 1¼ in., 10 to 70 ft heads, 1,725 to 3,450 rpm. Allis-Chalmers Mfg., Co.

Fire Alarm System

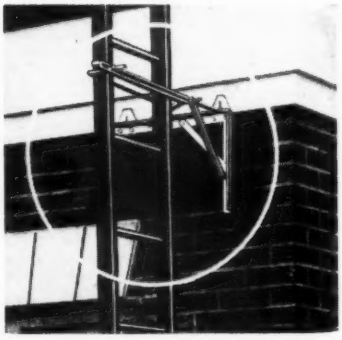
32 Termed the Type SA Master Code Fire Alarm System, this system consists of break-glass, non-code fire alarm boxes; fire alarm signals; and a control panel. The SA system is of the closed circuit type. Reliability of operation is featured in this new system through electrical supervision of all signals, boxes,



the windings of all relays, resistance units, and the motor used to drive the coding mechanism. Such supervision insures the sounding of a trouble bell in the event of circuit difficulties which would tend to render the system inoperative, yet no false alarms are sounded. One of the outstanding features is the method of adjusting the signal transmission speed to match the rhythm of the marching feet. Such a cadence tends to reduce panic while clearing the building rapidly and efficiently. Autocall Co.

Bracket Uses Ladders

33 A new type of bracket eliminates the expensive scaffold framework usually erected for application of wall materials as well as painting. The unit provides a solid support which holds ladders edgewise toward the building in a perpendicular position. Each bracket is



held in place by two spikes which can be left in place for future use if desired. A plank laid across the rungs of the two ladders thus supported may be moved up and down as required. Ladders may be adjusted for closeness to the wall as the job dictates. Brackets fold up and weigh only 26 lbs. per pair. Beaver Art Metal Corp.

Air Hoist

34 This new air hoist has a safety circuit that insures that this hoist will not drop its load, even if the air line breaks or the air supply fails. All metal fittings and piping. The valve is located near the top of the hoist to avoid interference with load lifting. The hoist is self lowering and uses a circuit that requires a minimum of compressed air, the manufacturer states. Smooth fast action (not jumpy) and high efficiency result from the use of precision honed tubing and close fit piston. Lower operating costs are obtained from the leakproof, low friction operation of the precision made parts. The unit is guarded by non-corrosive hard brass tubing, steel fabricated heads and caps, hard chrome plated rams, and dirt wipers that protect seals by cleaning the ram on the in stroke. Miller Motor Co.

Guilty of Manhandling?

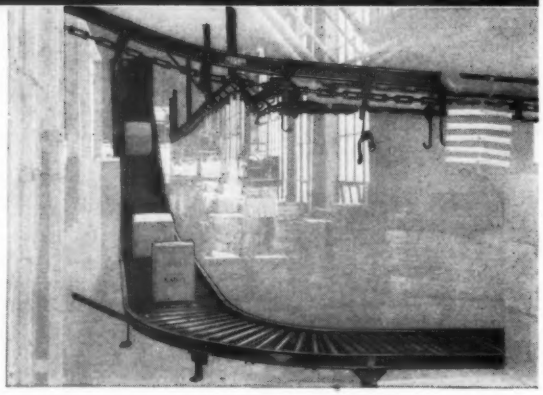


Photo shows a typical example of Buschman engineering and manufacturing skill: 1. an overhead chain-type trolley conveyor. 2. a floor-to-floor belt conveyor. 3. a roller conveyor. This installation is in the plant of a noted radio manufacturer.

Be both judge and jury. Why not let Buschman Engineered Conveyors sentence your slow moving material to a life of speeded production? A complete line of conveyors for practically every kind of industry. (Some of these are listed below.) Our engineers will gladly consult with you on your handling problems. Write for additional information.

THE E. W. BUSCHMAN CO., INC.

4426 CLIFTON AVE. CINCINNATI 32, OHIO

Buschman

Representatives in Principal Cities

Slat Conveyors • Belt Conveyors • Push Bar Conveyors • Vertical Barrel Conveyors • Chain Type Trolley Conveyors • Gravity Roller Conveyors • Live Roller Conveyors • Two Wheel Hand Trucks

An Excellent Addition to Your Engineering Bookshelf

PRACTICAL ENGINEERS' OPERATING POINTERS

Practical usefulness has been the keynote in the development of this book. In illustration and written paragraph it aims to fulfill a need for reliable operating information. It shows you how and why things are done to save money and secure best results. It tells how to avoid emergencies that lead to shut-downs and extensive repairs.

There Are 19 Big Chapters

Generators
Motors
Power Factor
Electrical Wiring
Distribution Circuits
Fluorescent Lighting
Transformers
Electrical Plant Kinks
Electric Safety Precautions
Distribution Circuit Problems
Steam Turbines
Steam Engines
Condensers
Piping
Valves
Flow Measurement
Piping Kinks
Hot Water and Steam Service Supplies
Pumps

239 pages, 6x9, fully illustrated, cloth binding, $2

-----ORDER FORM-----

TECHNICAL PUBLISHING CO.
53 West Jackson Blvd., Chicago 4, Ill.
I enclose $2. Send me a copy of Practical Engineers' Operating Pointers postpaid.

Name.....

Address.....

.....

PE

Bulletins . . . Catalogs

Property Maintenance

101 Windows, Doors, and Accessories—A bulletin of 36 pages describing the steel windows, doors, and the various accessories such as catches, hinges, trolleys, that go to make up units. Wm. Bayley Co.

102 Industrial Luminaires —Bulletin B-3964 — 8 pages—Installation and application photos make up the bulk of this bulletin and show the various types of mountings available for use in industrial work. The installation photos show the ways of mounting these fluorescent luminaires. Westinghouse Electric Corp.

103 Roof Protection—A 28 page roofing book filled with actual before and after photographs on repair and maintenance of roofs. Photos show how to prepare the roof, apply the coating and put on the fabric for the roof in general and for flashing. 15 pages of general instructions and estimates for covering roofs are provided. Roofs of all different types and compositions such as roof over concrete, roof over wood, paper or composition. United Laboratories, Inc.

104 Abrasive Safety Flooring—Bulletin FH6, 4 pages, describes the various forms in which this flooring is available and illustrates with application photos the spots in a plant where the safety flooring is applicable. Behr-Manning Div., Norton Co.

105 Corrosion Preventive Coating — A 4 page bulletin describing the products of this firm which include a high heat lining for stacks and chimneys, a waterproof coating for tanks storing water, soap, chlorine, brine, or other alkaline substance subject to corrosion. Plastic Steel Service.

106 Rolling Doors—Bulletin No. 49, 28 pages depicts the many different types of doors and steel rolling grills made by this firm and with application drawings and photos shows the controls and other equipment required for the operation of these doors by hand or by motor. Drawings through sills and jams show the manner in which the door is applied to the building framework. Sizes of doors available for each type are listed with specifications given. Kinnear Mfg. Co.

107 Concrete Floor Finish —This 4 page bulletin describes the composition and applications for which this solution of inert synthetic resins is suitable. Product may also be applied to wood or steel. Nukem Products Corp.

108 Anti-Corrosive Insulating Coating—This is a 4 page bulletin that explains the properties of this coating. The various acids it is reputed to resist are given, as well as the corrosive fumes, and alkali substances. Claimed to be suitable for application to wood, masonry, and metal structures, as well as felt, metal, and composition roofs. Service Industries.

109 Metal Protective Coating — This 20 page book presents the protective coating for metals made by this firm by the use of many application photos, coated and uncoated test and application photos, other illustrations show methods of application, such as spraying, brushing, and dipping. Industrial Metal Protectives, Inc.

110 Industrial Glass Block — Booklet IB-73, 36 pages, is arranged in ten sections on: Light, Insulation, Heat gain, Permanency, Protection of equipment, Sanitation, Sound reduction, Sizes and patterns, Installation, and Specifications. Application photos, charts, tables, and dimensional drawings are provided. American Structural Products Co.

111 Industrial Insulation —Form No. A 91, 24 pages, illustrates typical applications of the products of this firm. Tables, charts, application data, and descriptions of each product and its uses are given. Specifications provided. Thermal conductivity of various materials table, losses from flat iron surfaces, vertical iron surfaces, and iron pipe are given as well as effect of windage. Eagle-Picher Co.

112 Suspended Lights and Devices — Catalog No. 47, 98 pages, is the complete catalog of this maker of disconnecting and lowering fixtures for lights and other devices. Pertinent data for selection of fittings for many uses is given with prices. Most equipment is illustrated and sizes available stated. Thompson Electric Co.

113 Porcelain Tank Linings — This 8 page folder describes and explains the porcelain lining for tanks with illustrations and list of the claimed advantages. Recommended by the maker for use in tanks containing hot or cold water, and for filter, softener, fire sprinkler, and drinking water tanks. Howe E. Baker Co.

114 Naphthenate Preservatives — Bulletin No. 381, 6 page folder, describes the naphthenate preservatives made by this firm and explains their action. Listed are the materials of wood and textiles they may be applied to. Quigley Co., Inc.

115 Watchmen's Clocks— This is an eight page pamphlet explaining the clocks and watch stations offered by this firm. The construction and operation of the clocks and stations is described. Chicago Watchclock Corp.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

MODERN CENTRAL SILK DYEING & FINISHING COMPANY
INCORPORATED
120-124 THIRD AVENUE
PATERSON, N. J.

O. C. Keckley Co.,
565 Washington Blvd.
Chicago, Ill.

Gentlemen:

The writer feels that it is his duty to comment on the services rendered by your representative, Mr. J. De Long, and also on the products which have proven a great benefit to us.

In common with dye houses as a whole, we were troubled severely in our processing by extreme dropping of steam pressure, especially at peak loads, it being not uncommon for the boiler pressure to drop as much as fifty to sixty pounds within a few minutes time, so when your Mr. De Long informed the writer, that it was possible to overcome to a great extent this condition, it sounded too good to be true, but after having had one of your 6" Keckley Precision Pressure Regulators in service as specified by your representative and having closely noted results, we find that the claims made by him were too modest, as the regulation being attained exceeds even our expectations.

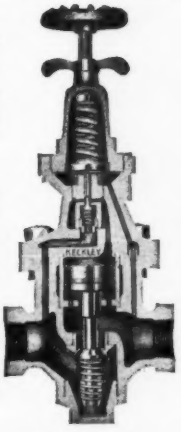
Not only do we secure more even steam pressure to our dye house connections but also with a steadier pressure available at the boilers, our set up is benefited, our production speeded up and our costs reduced.

In short every piece of Keckley equipment we have in use has proven highly satisfactory and in all cases fulfilled the claims made for it.

Yours very truly,
Modern Central Silk Dyeing & Finishing Co., Inc.
A. Johnny Supt.

"... Our Production SPEEDED UP and Our Costs Reduced"

OBSERVE how Keckley Regulators at the Modern-Central Silk Dyeing and Finishing Company assured a more even steam pressure to the dye house connections and a steadier pressure at the boilers. This letter is typical of those received from scores of satisfied users of Keckley products.

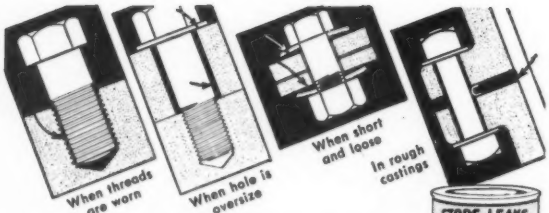


Why not find out what Keckley Regulators can do and save in your plant? They come in sizes ½ in. to 8 in., for pressure reduction from 300 lb. to 1 lb. without change of spring. Our engineering department will gladly cooperate with you in working out pressure regulation problems.

Write for Bulletin No. 52

O. C. KECKLEY COMPANY
400 W. MADISON STREET
CHICAGO 6, ILL.

Steam Traps—Temperature Regulators—Pump Regulators
Water Gauges—Gauge Clocks—Strainers



How to Solidly Anchor LOOSE BOLTS

Bolts with worn threads—undersize bolts in oversize holes—bolts passing through thin walls—bolts holding ill-fitting cast flanges—all can be tightened firmly with quick-setting Smooth-On No. 1 Iron Cement. Use it, too, to lock nuts tight, and to cover and protect countersunk bolt heads in metal or wood. These repairs stay tight because Smooth-On expands slightly as it hardens. Buy Smooth-On No. 1 in 1-, 5- or 20-lb. size and keep it handy. If your supply house hasn't Smooth-On, write us. SO-291

FREE REPAIR HANDBOOK

40 pages filled with time-saving, money-saving repairs on plant, shop and home equipment made with No. 1 and other Smooth-On Cements. Drop us a line for YOUR free copy.

SMOOTH-ON MFG. CO., Dept. 85G
570 Communipaw Ave., Jersey City 4, N. J.

Do it with **SMOOTH-ON**
THE IRON CEMENT OF 1000 USES

END THE DANGER OF SCALDING and unexpected shots of hot or icy cold water

Install

POWERS THERMOSTATIC SHOWER MIXERS

TYPE H MIXER
For Exposed Piping

They are safe both ways!

Keep shower users happy and safe with Powers Mixers. They eliminate danger of scalding and there is no slipping and falling while trying to dodge an unexpected change of hot or cold water temperature.

Being *thermostatic*, Powers Mixers give *two-way* protection against both *pressure* and *temperature* changes in water supply lines. They are the safest shower bath regulators made. 481

Phone or write our nearest office for circular H547

CHICAGO 14, 2746 Greenview Avenue • NEW YORK 17, 231 East 46th St. • LOS ANGELES 5, 1808 West Eighth St.

THE POWERS REGULATOR CO.
OFFICES IN 47 CITIES • SEE YOUR PHONE BOOK
Over 55 years of WATER TEMPERATURE CONTROL

Materials Handling

116 Hand trucks—Bulletin No. 31 describes the line of hand trucks available in 24 different models from this firm. A 2-page bulletin. It tells how to order the exact frame and wheel types needed. 4 frame styles with either one or two handles, solid or open toe, with choice of five wheel styles are given. E. W. Buschman Co., Inc.

117 Vibrating Screens—A 4 page bulletin describing the vibrating screens made by this firm for sizing or separating any kind of material. Explained are the bearings, circle throw, adjustable stroke, angle adjustment, construction, mounting, and screen cloth. Many various sizes listed. Hewitt-Robins Incorporated.

118 Magnetic Separators—Bulletin No. B-1009A—A two-page data sheet giving the tables of capacities, dimensions, sizes available of the non-electric permanent magnetic separators. Typical drawings of applications are given showing the various angles and methods in which it may be applied. Dings Magnetic Separator Co.

119 Materials Handling Equipment—Bulletin 7-11, 52 pages, describes and illustrates the tractors and trailers, trailer accessories, for trucks, load carrying trucks, and power supply units. Specifications, dimensional drawings, assembly photos, and many sketches and photos showing how the equipment made by this firm may be used. Mercury Mfg. Co.

120 Small Electric Hoists—Bulletin 7171-A—describes with cutaway drawings and installation photos small hoists made by this firm. Dimensional drawings and tables are given for the several models presented. Auxiliary equipment such as the wire, block, controller, switches, are noted and explained. Robbins & Myers, Inc.

121 Pneumatic Conveying Systems—Bulletin No. 101, 8 pages, makes use of application flow diagrams to show the many spots that this type of conveyor can be used in. Pertinent information in regard to quantities, speeds, quality of construction materials, and sizes, are given. Convair Corp.

122 Overhead Chain Conveyors—Form 645, 20 pages, describes with many application photos and sketches and material flow diagrams the use that can be made of these conveyors by handling materials overhead thus leaving floor space for productive work. Lamson Corp.

123 3 Ton Low Lift Truck—Bulletin 1115-c, 4 pages, describes and illustrates the truck and certain important parts. A dimensional drawing gives pertinent information. Another drawing shows the turning radius needed. Baker Industrial Truck Div., Baker-Raulang Co.

Electrical

124 Electrical Conduit—Bulletin 351, 64 pages, describes and illustrates the process that conduit goes through in manufacture. Electrical data, definitions of terms, symbols, computing conductor sizes, and other information is provided. Spang-Chalfant Div., National Supply Co.

125 Electrical Line Connectors—Bulletin No. 48Y1—8 pages, depicts with blown up drawings, sketches, photos of equipment, dimensional tables, charts of sizes, types, connectors available and the tools for applying the connectors to the line. Burndy Engineering Co., Inc.

126 Dry-Type Transformers—Booklet B-4009 describes with cutaway photographs and charts dry-type transformers. These transformers are suitable for 120-140 volts covering standard range, standard rating from 0.025 to 2,500 kva single phase and 9 to 3.750 kva, three-phase. Westinghouse Electric Corp.

127 Copper-Oxide Rectifiers and Controls—Bulletin 21, 28 pages, explains the unit installation of rectifiers. Technical diagrams and tables for both manually and automatically controlled rectifiers and their capabilities are given. Appliance & Merchandise Dep't., General Electric Co.

128 Continuously Adjustable Transformers—Form 424-H, 8 pages, describes the continuously adjustable transformers made by this firm for industrial use. Charts, tables, dimensional drawings, specifications, highlight photos of construction, and the various wiring diagrams suitable for these transformers. General Radio Co.

129 Electrical Equipment—Catalog No. 48-A, 16 pages, discusses and specifies the various types of lightning arresters, gas relays, terminal strip, potheads and other electrical equipment made by this firm. Photos, wire sketches, and dimensional drawings, illustrate the equipment offered. L. S. Brach Mfg. Corp.

Heating and Ventilating

130 Constant Differential Oil Burning System—Completely diagrammed and charted, bulletin No. 109-A not only explains how the constant differential system operates but also illustrates, in cutaways, the atomizer itself with complete explanation of how extreme fluctuating loads are handled under positive regulation with full flame control. Peabody Engineering Corporation.

131 Smoke, and How to Prevent It—This book of 16 pages contains no advertising matter. It is completely a self-help book to acquaint the reader with all the facts on smoke. It explains: causes, cost, and prevention of smoke, on hand, stoker, oil, and gas fired installations in all types of plants. Included is a 4 page folder showing the application of the equipment of this company to prevent smoke. Perfex Corporation.

132 Water Test Manual—This manual of 62 pages is the collection of bulletins on the water treatment methods and equipment offered by this firm. The various steps in each treatment in addition to the chemicals to be used are given and discussed in detail. Color is used in the photos to show color of reaction. Dearborn Chemical Co.

133 Operation and Care of Power Boilers—Illustrated with color to

show proper combustion with this type of boiler. Text explains, in order, rules to remember, construction of the boiler, identification stampings, how to wash a boiler, putting the boiler in service, handling the boiler in service, hand firing, care of grates in service, what to do when boiler is out of service, and all the various phases to consider with each stage. Kewanee Boiler Corporation.

134 Mechanical Draft Cooling Towers—Bulletin 36, 4 pages, describes recent design changes in the type 2K-S spray-filled induced draft cooling tower. A plan view is given showing the distribution of the framing and the valve. Also, three plan views are given showing the actual construction of the framing. The nozzles used in the tower are also illustrated. Information table with capacity sizes and weights on the steel cased induced draft cooling tower is provided. A handy table of 2K-S tower sizes and capacities based upon the use of the tower at 10 F cooling range and with bulb conditions is given. Binks Mfg. Co.

136 Condensate Return Units — Bulletin 201—6 pages depicts with equipment photos and photos of various controls from component parts of the unit, the construction and assembly of these package condensate return units. Tables of capacities for various applications and tables of water required per minute to feed boiler per horsepower are given. Roy E. Roth Company.

137 Heating Controls — Catalog F-99, 28 pages utilizes equipment, cut-away photos and drawings with charts, specification tables, to show the construction, installation and application of the many different types of controls in valves, heaters, tankless heaters and converters made by this firm. Many different installation diagrams plus capacity tables on the heaters are given. Taco Heaters, Inc.

138 Worm Feed, Side Dump Stokers — Bulletin No. 500, describes and illustrates in 8 pages the stokers made by this firm. Application photos, dimensional drawings, cross-sectional drawings, and photos of the worm and gear mechanism help explain the construction and operation. Canton Stoker Corp.

139 Flexible Exhaust Tubing—This pocket size 6 page folder describes with photos the types of flexible exhaust tubing offered. Many sketches show the various applications the tubing finds in different industries. American Ventilating Hose Co.

140 Gas Burner—Bulletin SP1, 4 pages, describes and explains these ready to be installed gas burners. The several sizes available with their attendant Btu ratings are shown. A sketch showing method of installation is given. B. P. Lientz & Co.

141 Exhaust Ventilators—Form No. 29 is this firm's latest catalog. The roof mounted ventilators that the firm makes are described and the sizes and types available listed with the pertinent dimensions for each. Phantom views, dimensional drawings, and many application photos depict the construction and operation. Powermatic Ventilator Co.

142 Flue Gas Analyzer—Bulletin No. 1136A, 4 pages, details the effect stack gases have on combustion efficiency of fuel. It explains how the new unit analyzes the composite of the stack gases and indicates deviations from the ideal. Photos and schematic drawings show details of analyzer. Davis Emergency Equipment Co., Instrument Div.

143 Water Tube Steel Heating Boilers—This 8 page bulletin explains these boilers and their use with various firing methods. Gas flow diagrams are presented. Sketches and photos explain the construction. Steam rating for mechanical firing is 2680 to 42,500. International Boiler Works Co.

Instruments and Controls

144 Electronic Level, Pressure, and Temperature Control—Catalog No. 27, 8 pages, describes the relay made by this firm that may be used for liquid level and interface control and alarm, pressure and flow, temperature, and high foam control and alarm. Types, specifications, and list prices are given. R-S Products Corp.

145 Construction Materials for Flow Measuring Instruments—Bulletin No. 10003, 4 pages, is a listing of the recommended materials to be used in the flow measuring instruments made by this firm. The fluid to be measured and the materials for fittings, float, and packing are given in that order. Special list of substitute materials is given for those parts that must be cast. Fischer & Porter Co.

146 Stop Watches—Bulletin No. 576, 4 pages, describes and illustrates the stop watches and chronographs made by this firm in both pocket and wrist styles. Essential information on each instrument is offered. These are 1/5, 1/10, and 1/100 sec timers. Decimal timers also offered. Herman H. Sticht Co., Inc.

147 Electrical controls—This is a complete catalog of the company made up completely of bulletins on the various pieces of equipment on many different types of applications. Color photographs, specifications, tables, price lists on all equipment are listed. Specifications. Penn Electric Switch Company.

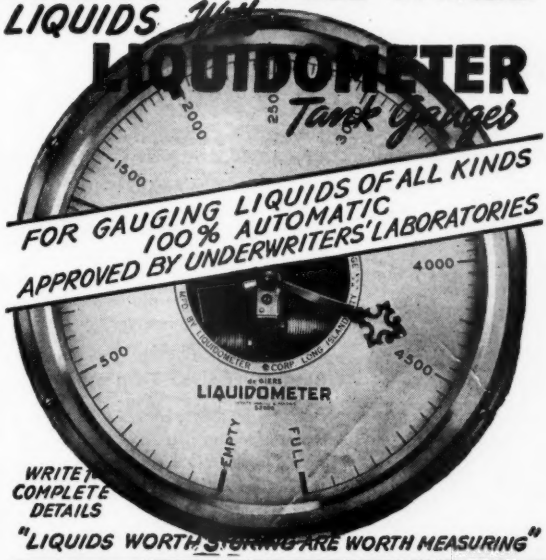
Lubrication Equipment

148 Industrial Lubricating—This company's complete line of industrial lubricating equipment such as heavy duty drum pumps, standard drum pumps, lubricating drums, dispensers and other items are covered in this collected series of bulletins. Construction features of each type of item are covered completely and illustrations are unusually good. Lincoln Engineering Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

COSTLY HUMAN ERRORS ELIMINATED WHEN YOU MEASURE VALUABLE STORED LIQUIDS With

LIQUIDOMETER Tank Gauges



FOR GAUGING LIQUIDS OF ALL KINDS
100% AUTOMATIC
APPROVED BY UNDERWRITERS' LABORATORIES

WRITE FOR COMPLETE DETAILS

"LIQUIDS WORTH STORING ARE WORTH MEASURING"

THE LIQUIDOMETER CORP.
36-31 SKILLMAN AVE., LONG ISLAND CITY, I, N.Y.

TOUGH RESURFACER

FOR BROKEN Concrete or Wood Floors

Makes Durable Patch or Complete Overlay

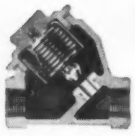
Resurface or patch broken concrete floors with tough RUGGEDWEAR resurfacer. Here's a material which will stand up under the most punishing traffic conditions. Simple to install—no chopping or chipping required. Merely sweep out the spot to be repaired—mix the material—trowel it on. Holds solid and tight right up to irregular edge of old concrete. Provides a firmer, tougher, smoother, more rugged wearing surface. Used indoors or out. Dries fast.

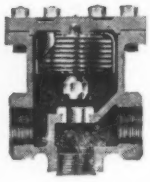
MAIL COUPON for FREE TRIAL OFFER

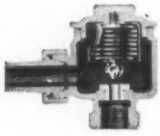
FLEXROCK COMPANY
3615 Cuthbert St., Philadelphia 4, Pa.
Offices in principal cities.
Please send me complete RUGGEDWEAR information and details of TRIAL ORDER PLAN—no obligation.
Name .....
Company .....
Address .....

More Service Tests Confirm that Nicholson Steam Traps Furnish . . .

2 to 6 Times MORE DRAINAGE Capacity







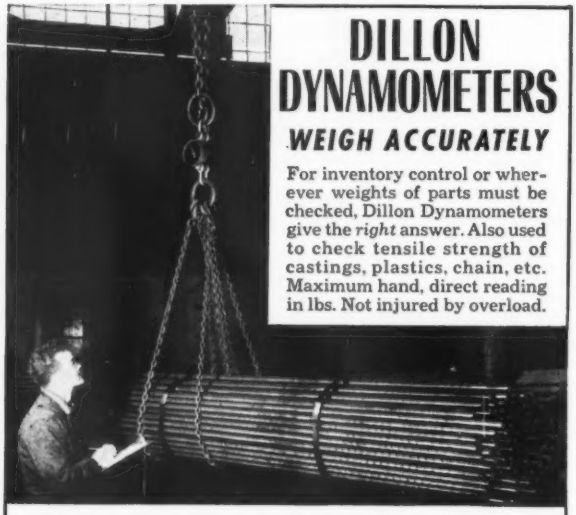
Recent comparative tests by large users of steam traps again showed the unequaled drainage capacity of Nicholson traps. The record low for steam waste was also shown. Some Nicholson features: larger valve orifice; operate on lowest temperature differential; no freeze-ups; no adjustment of valve or seat.

Put a Nicholson Trap on Test

See why leading plants are increasingly standardizing on Nicholson steam traps. We'll gladly send one for testing. 5 types for every application: size ¼" to 2"; pressure to 225 lbs. BULLETIN 1047.

W. H. NICHOLSON & CO. 208 OREGON STREET WILKES-BARRE, PA.

Valves • Traps • Steam Specialists



DILLON DYNAMOMETERS

WEIGH ACCURATELY

For inventory control or wherever weights of parts must be checked, Dillon Dynamometers give the *right* answer. Also used to check tensile strength of castings, plastics, chain, etc. Maximum hand, direct reading in lbs. Not injured by overload.

ACCURATE—COMPACT

Weigh only 8 lbs. 4 oz., measure 8¼"x6¼"x3". Capacities from 500 up to 20,000 lbs. Equipped with shackles. May be used with turnbuckles, overhead crane, block and tackle, etc. Thousands in daily use. Low cost—immediate delivery.

WRITE DEPT. CX FOR LITERATURE

W. C. DILLON & CO., INC. 5410 W. HARRISON STREET CHICAGO, ILLINOIS

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

149 Oiling Devices — Bulletin No. 15 lists the oiling devices made by this company for use with engines, pumps, compressors, presses. These are suitable for application to moving as well as stationary parts. Telescopic tube sets are listed as well as repair parts for oiling equipment. Dimensional drawings of all parts and devices are given as are photos of actual equipment. Wm. W. Nugent & Co., Inc., Mfgrs.

150 Liquid Filters—Bulletin D-IL, 8 pages, describes the liquid filters with text, photos, cutaway drawings, exploded views, phantom views, and tables. Dollinger Corp.

151 Lube Oil Testing — While Bulletin 200, 8 pages, presents the equipment for testing it also shows the step by step process to be followed for testing lube oils. Gerin Corp.

Mechanical Power Transmission

152 Flexible Couplings — Catalog 48, 24 pages, describes and explains with photos, sketches, and dimensional drawings the construction and application of these flexible couplings. Size and dimensional tables are given for each type. Ajax Flexible Coupling Co., Inc.

153 Transmission Belt Maintenance — This 16-page bulletin deals with the cleaning, treating and applying of belt dressing to transmission belts. The subject of de-oiling belts is discussed with the recommendation of this company. Equipment made by this firm for oiling, cleaning and de-oiling of belts and their bearings are given. Du-Grip Manufacturing Company.

154 Geared Motor Power Drive — Form F-1498, 16 pages, utilizes equipment and phantom views in color to explain the construction of the single reduction gear motors and the double reduction variable speed gear motor drive offered. Color is also used to show the methods used in construction. U. S. Electrical Motors, Inc.

155 Hydraulic Torque Converters — Bulletin No. 135 B, 16 pages, describes the Models F and CF made by this firm. Phantom views, parts photos, cross-sectional and dimensional drawings, tables, and equipment photos explain the construction and operation of the torque converters. Twin Disc Clutch Co.

156 Variable Speed Reducers — Bulletin WT 4-48, 4 pages, describes the transmissions and variable speed reducers for machine tool and other industrial applications made by this firm. Reduction ratios, hp capacities, and types of mounting are given. Western Mfg. Co.

157 Variable Speed Selector — Bulletin 8-7531 GI, 4 pages, describes the operation of the speed selector. Photos show positions of V-belt at various speeds, and several applications. A dimensional drawing with accompanying table is given. Horsepower and torque rating tables are provided for each of the 3 models. B. F. Goodrich Co.

Handling Liquids

158 Double Suction Centrifugal Pumps—Catalog No. A1147, 20 pages, explains the operation and construction of these pumps and discusses performance. Tables of selection and specifications are provided. Charts are used to show the performance that may be expected. Economy Pumps, Inc.

159 Turbine and Centrifugal Pumps—Bulletin of 12 pages explaining with diagrams, cutaway sections, tables, and text the condensate, deep well, mixed flow, centrifugal, and turbine pumps made by this firm for industrial use. Aurora Pump Co.

160 Supplement to Engineering Data Book—Supplement No. 111 has 20 pages and is devoted to specifications of several new items on the subject of welding fittings and flanges for industrial piping. Tube Turns, Inc.

161 Cold Forged Steel Unions—Bulletin U602, 4 pages, presents with cross-sectional views and tables the unions made by this firm. Available with silicon bronze, stainless steel, and moly steel seats and with speed threads or socket-weld joints. Rockwood Sprinkler Co.

162 Pipe and Fin Coil Engineering Data Book —This 36 page engineering data book was prepared for the engineer and draftsman as a guide in the design of pipe and fin coils, with specific data on the subjects of dimensional limitations, coil development formula and heat transfer factors. Rempe Co.

Valves

163 Heavy Duty Steam Valves—Bulletin 8-B—A 28 page bulletin pictures and describes this line of boiler stop valves, check valves, stop check valves and triple duty valves for medium and high pressure service from 250 to 2,100 lbs., and temperatures up to 1150°F. Schutte and Koerting Company.

164 Salt Water Disposal Valves — This 4 page bulletin describes the applications to which these valves are suitable. Black, Sivalls & Bryson, Inc.

165 Pressure Reducing Valves, Streamlined—The construction and operation as well as capacities of these valves is depicted with colored flow diagrams, cutaways, and capacity charts for obtaining the correct size and type. A. W. Cash Company.

166 Expansion, Solenoid, Valves; Controls—Catalog presenting equipment made for refrigeration and air conditioning by this firm. Illustrated with photos of equipment. Seven of 15 pages are given to capacity tables. Detroit Lubricating Co.

167 Pressure Reducing Valves — Bulletin No. 477 explains and discusses this firm's pressure reducing valves of the self-contained type, master pressure controls, remote controls, and desuperheaters. Well illustrated with application photos and cutaways to show construction and operation. Tables present further data on the equipment. Northern Equipment Co.

168 Diaphragm Valves — Bulletin No. V-47 utilizes exploded drawings, cut-away photographs, maintenance photos and flow sketches, to show the use of these valves and their construction. Application of valves for various jobs, operating models, sliding stem model, and four air operated models make up the contents of the book. Hills-McCanna Co.

Tools

169 Scrapping Shear—Bulletin 2M, 4 pages, describes and illustrates with photos the No. 11-A scrapping shears made by this firm. Highlights of construction are pointed out and a list of the specifications is given. Canton Div., Hill Acme Co.

170 Miniature Fluorescent Lamps—This is a four-page folder describing the 4 types of general utility lamps for use on lathes, small positions, or a spotlight as wanted where an even distribution of illumination has to be achieved. Stocker & Yale.

171 Work Spotlights—This 6 page folder bulletin utilizes many application photos from various industries to show how the spot lights made by this firm can be used. Fostoria Pressed Steel Corp.

172 Blank Cartridge Driving Tool—Bulletin No. TA-15, 2 pages, describes the operation and applications of this tool for driving rivets or studs or anchors, into wood, steel, concrete, or other masonry. Mine Safety Appliances Co.

173 Hydraulic Jacks—Bulletin No. DN3-465-R, 4 pages, explains the construction of these hydraulic jacks with a phantom view. The several models offered are illustrated. Duff-Norton Mfg. Co.

174 Portable Shop Cranes —Bulletin 5M, 4 pages, describes and explains the construction and operation of these cranes, as well as showing with photos the many applications to which it is suitable. Canton Div., Hill Acme Co.

175 Grinding Oil—This is a 24 page pocket size booklet that explains the manner in which to select cutting oils for different materials. A standard marking system chart is provided. Tips are given for handling grinding oils. D. A. Stuart Oil Co.

Fasteners

176 Stainless Steel Fastenings—This 4 page bulletin is the product list of the fastenings made by this firm from stainless. Products include the standard nuts, bolts, and screws, and various pins, rivets, washers, nails, pails, sink bowls, pipe and pipe fittings. Pertinent data as to size and materials analyses are given. Anti-Corrosive Metal Products Co., Inc.

177 Single Unit Lock Nuts —This 6 page pocket size folder depicts in a cross-sectional drawing the action of the locking feature. Dimensional drawings are given for types offered. An-Cor-Lox Div., Laminated Shim Co., Inc.

Miscellaneous

178 Flexible Metal Hose—Catalog No. 113 — 24 page booklet describing and illustrating the flexible metal tubing made by this firm. Tables are given for sizes and recommended pressures. Dimensional tables are presented for standard pipe fitting, flared tube fittings and inverted flared tube fittings, also compression tube fittings. 2 pages are devoted to typical assembly for industrial pipe fittings and typical assemblies with SAE fittings. Pipe and copper tube applications are also presented. Titeflex, Inc.

179 Water Treatment Feeders—Bulletin No. 844112—6 pages complete with actual installation photographs showing the feeders in operation. Calgon, Inc.

180 Plumbers and Steamfitters Packing—This 2 page fold out sheet describes the packing made by this firm for use on plumbing fixtures and explains its use by the steam fitter. Photos and sketches are used to depict the application. Flexrock Co.

181 Water Softeners and Dealkalizers—Bulletin No. 2418, 12 pages, utilizes application photos, charts, bar graphs, schematic hook-up diagrams, phantom views, tables, and typical analyses of water treatment problems to explain the water softeners and dealkalizers they make. The Permutit Co.

182 Welded Ball and Cylindrical Floats—Bulletin No. 348, 8 pages, features welded floats of stainless steel, Monel, and chrome plated steel, in spherical, elliptical and cylindrical shapes with price list, weights, buoyancies, and collapsing pressures and other information. W. H. Nicholson & Co.

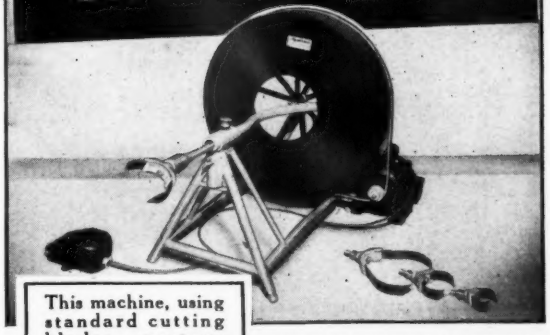
183 Stainless Steel Plates —Bulletin SS7-ED1, 32 pages, is intended to supply information on the selection and fabrication of both solid stainless steel and stainless clad plates. The bulletin is sectionalized for reference. Tables, charts, ASTM specifications, and pertinent data are given. Allegheny Ludlum Steel Corp.

184 Research Laboratory Service — This 8-page bulletin describes the service offered to firms needing research done by laboratory. Listed are all the chemical analysis they have available and also price of reports and formulas. Chemical Specialties Research Laboratories.

185 Alloy Spring Steels—This 16 page booklet is an abstract of an engineering paper on this subject. Presented is data on the physical properties of three alloy steels used for hot-formed springs, together with properties of plain carbon steel spring for comparison. International Nickel Co., Inc.

SEE OUR EXHIBIT AT THE NATIONAL POWER SHOW—ST. PAUL, MINN., AUG. 22-26, BOOTH 114

$2900.00 SAVINGS ON A SINGLE JOB!



This machine, using standard cutting blades, unstops pipe 3" to 8" in diameter. Removes slush and sediment from process piping, roots and other obstructions from lateral sewer lines.

Write for full information and prices.

SPARTAN ELECTRIC SEWER MACHINES have again and again saved many times their cost on a single job. Recently one of the country's largest manufacturers was faced with a plant shut-down because a steam riser had clogged with boiler scale. In less than an hour a Spartan Electric had cleared the line. Over $2900 in replacement costs were saved!

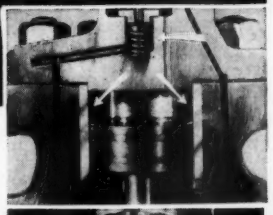
Spartan TOOL COMPANY

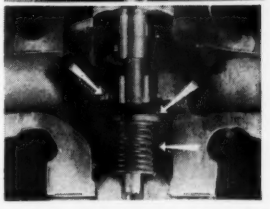
6003 N. Lincoln, Chicago 45

TRADE LESLIE MARK

Exclusive Features —at no extra cost!

- STELLITED SEAT RINGS
- STAINLESS STEEL 800 BRINELL MAIN VALVES
- CORROSION RESISTANT SPRINGS
- HARDENED STAINLESS STEEL CYLINDER LINERS





Supplied as *standard equipment* in LESLIE Pressure Reducing Valves, Pressure Controllers, Pump Governors, Temperature Regulators for Steam services.

Write for Bulletin 461.

ESTABLISHED 1900 LESLIE CO.

305 Grant Avenue, LYNDHURST, NEW JERSEY

PRESSURE REDUCING VALVES · PRESSURE CONTROLLERS
PUMP GOVERNORS · TEMPERATURE REGULATORS
SELF CLEANING STRAINERS · LESLIE-TYFON WHISTLES

For **FLOORS** *ruined by*

WATER
GREASE
ACIDS
OILS
CHEMICALS
ABRASIVE WEAR

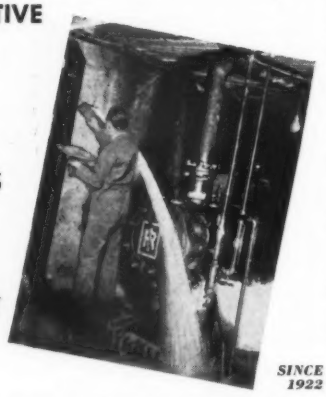
patch or resurface with

STONHARD STONPACH

Used in every industry where floors are subject to severe conditions—STONHARD STONPACH is extremely tough, hard, and wear-resistant. Any handy man can patch or resurface your floors quickly and simply — no delay — STONHARD STONPACH is ready for the heaviest trucking within 24 hours. Speed traffic—reduce accidents—lower maintenance costs with STONHARD STONPACH.

Stop **LEAKS** *instantly*

QUICK • POSITIVE
WATERPROOF
for
BASEMENTS
FOUNDATIONS
TUNNELS
PITS - DAMS
ALL MASONRY



SINCE 1922

use

STONHARD STONTITE

Anyone can effectively stop leaks by simply applying STONHARD STONTITE. It makes a perfect seal—stopping large leaks or even hair-crack water seepage. Eliminate the danger of costly water damage to machinery, equipment or stock—investigate STONHARD STONTITE.

STONHARD COMPANY
104 Stonhard Building, 1306 Spring Garden Street
PHILADELPHIA 23, PA.

Send for **FREE** *copy of Maintenance Manual*

STONHARD COMPANY
104 Stonhard Building 1306 Spring Garden Street
Philadelphia 23, Pa.

Please send me a FREE Maintenance Manual—

Firm .....

Mr. ..... Title .....

Address .....

City ..... Zone ..... State .....

ADVERTISERS' INDEX

Anderson Co., The V. D. ..... *
Anti-Corrosive Metal Products Co., Inc. ..... *
Armstrong Machine Works 3

Beaver Pipe Tools ..... Inside Front Cover
Biddle Co., James G. ..... *
Buschman Co., Inc. The E. W. 44

Cash Company, A. W. 5
Chicago Metal Hose Corporation 14
Cochrane Corporation ..... *
Combination Pump Valve Co. ..... *
Cook's Sons, Inc., Adam ..... *
Crocker Wheeler Elec. Mfg. Co. 8-9

Dart Mfg. Co., E. M. 43
Davey Compressor Co. ..... *
Dillon & Co., Inc., W. C. 48
Dollinger Corporation ..... *
duMont Corporation, The ..... *

Economy Pumps, Inc. 7
Executone, Inc. ..... *

Flexrock Company 47
Foster Wheeler Corp. ..... *

Garlock Packing Co., The ..... *
General Electric Company ..... *

Hays Corporation, The ..... *

International Nickel Co., Inc., The ..... *

Jeffrey Mfg. Co., The ..... Back Cover
Jenkins Bros. 13

Keckley Co., O. C. 45
Kinnear Mfg. Co. ..... *
Kirk & Blum Mfg. Co., The ..... Inside Back Cover
Klipfel Mfg. Co. 7

Leslie Company 49
Liquidometer Corp., The 47

Mercoid Corporation, The ..... *
Metallizing Engineering Co., Inc. 11

Niagara Blower Company 41
Nicholson & Co., W. H. 48

Powers Regulator Co., The 46
Prat-Daniel Corp. ..... *

Sexauer Mfg. Co., Inc., J. A. ..... *
Smith Corp., Winfield H. ..... *
Smooth-On Mfg. Co. 46
Spartan Tool Company 49
Spencer Turbine Co., The 37
Speco, Inc. ..... *
Star Fuse Co., Inc. ..... *
Sticht Co., Inc., Herman H. ..... *
Stonhard Company 50
Superior Combustion Industries, Inc. ..... *

Treasury Department ..... *

United States Motors Corp. ..... *

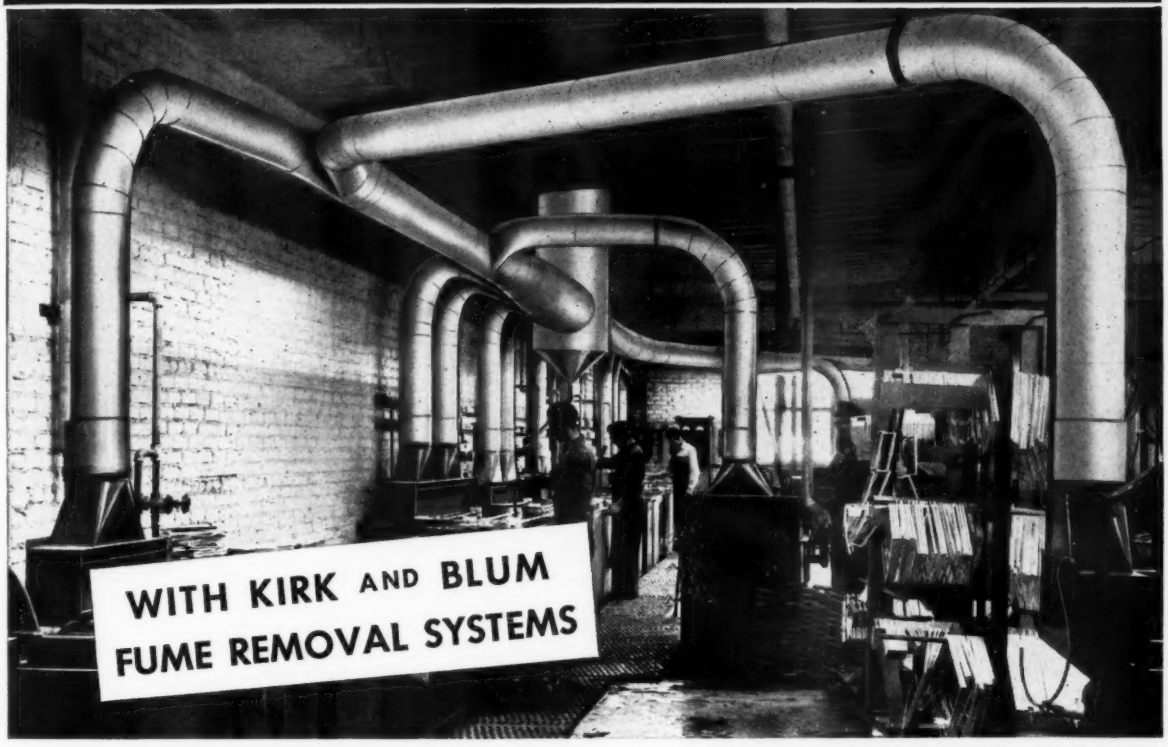
Waldron Corp., John ..... *
Ware Fuse Corp. ..... *
Wiley & Sons, Inc., John ..... *
Worthington Pump & Machy. Corp. ..... *

Yarnall-Waring Company 39

Zurn Mfg. Co., A. J. ..... *

Firms whose advertising is not in this issue but is appearing in other issues are marked with an *

There's no Fuss 'n Fume here....



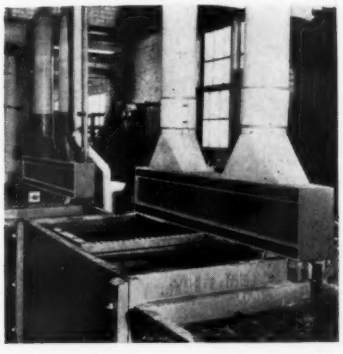
IN the modern plating rooms at the S. E. Overton Co., South Haven, Michigan, thousands of metal picture frames are cleaned and plated each day. And because KIRK & BLUM Plating Tanks are coupled to an efficient KIRK & BLUM Fume Removal System, there's no "fuss and fumes." Production consistently betters older records . . . there are no complaints from the workmen . . . valuable equipment is protected from the effects of acid fumes.

A Kirk and Blum Engineer will be glad to show you other photos and data, even arrange a trip to a nearby KIRK & BLUM equipped shop and explain how you can get more profit from plating operations. Write for Catalog "Fan Systems for Various Industries."—**The Kirk & Blum Manufacturing Co., 2889 Spring Grove Avenue, Cincinnati 25, Ohio.**

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

FUME CONTROL SYSTEMS



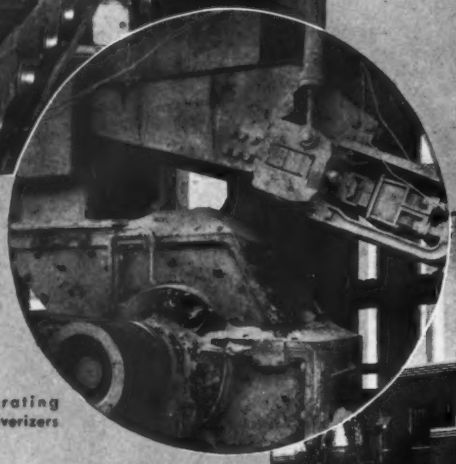
Whatever your plating process . . . various acids, hand operation, semi - automatic or automatic . . . there is a KIRK & BLUM Fume Removal System to make your plating shop more workable, more profitable.

FOR SERVICE THROUGH THE YEARS

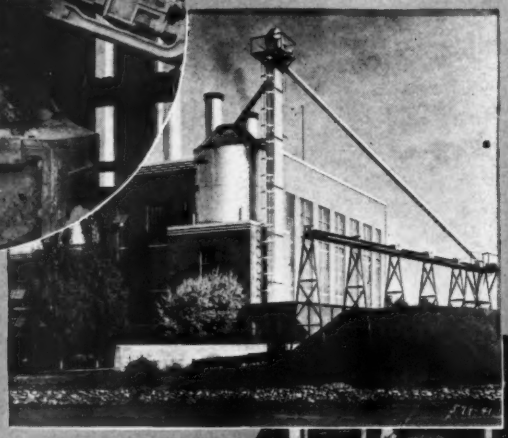
Jeffrey
MATERIAL HANDLING EQUIPMENT

Handling costs are to be found in most unexpected places. The task of detecting all of these, applying remedies and co-ordinating them with the manufacturing scheme, requires specialized skill and experience. Jeffrey has been building material handling equipment for seventy years . . designs almost every type . . some that cannot be obtained elsewhere. Our engineers have built up in these years the experience and skill . . have the resources of devices and material . . to throw wide open a vast source of potential cost reduction. Give us the opportunity to show you.

Steel apron conveyor. (Also wood apron conveyors)



Electric vibrating feeders and pulverizers



FOR HANDLING LARGE QUANTITIES OF BULK MATERIAL. A CONSTANT, UNINTERRUPTED FLOW

Coal and ashes handling — bucket elevators, conveyors, weigh larries, skip hoists, crushers, car pullers, etc.

Belt conveyors (troughed or flat belt types).

THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

905-99 North Fourth St., Columbus 16, Ohio

Baltimore 1 · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 13 · Denver 2 · Detroit 13 · Harlan · Houston 5 · Huntington 19 · Jacksonville · Milwaukee · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 3 · Salt Lake City 1 · Scranton 3

Complete Line of Material Handling, Processing and Mining Equipment